

The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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Foot Power Band Sawing Machine.

The machine which we illustrate herewith is an attempt to do for the band-saw what has already been done successfully for the jig-saw—adapting it to use by foot power. A foot power band sawing machine has the same advantages, in the class of work for which it is suited, in continuous motion and in speed of cutting, which the regular machines have, and is to be preferred over the foot power jig-saw accordingly.

The parts to this machine are very few, and the construction, as may be seen by the engraving, is very simple. The principal pieces of which it is composed are an upright standard, which, by means of suitable feet, is bolted to the floor; two brackets carried by it, which sustain the wheels; the wheels which carry the saw, a treadle, crank and fly-wheel.

The saw employed is of the well-known type ordinarily used upon band sawing machines, and runs upon wheels in the usual manner. The principal bracket carries an arm which holds the guide. A pulley on the shaft of the lower wheel is belted to the driving wheel, which in turn is driven by the crank connected with the foot treadle.

The saws used in connection with this machine are made thinner and finer than those used in the large machines, and are tempered by an entirely new process. The success attending their manufacture has been so great that the makers feel justified in warranting them from breaking.

The manufacturers claim for this machine that it is the most complete of its kind ever offered to the public. It is the only one that can be run with equal success by either foot or steam power. It is also claimed for it that it can do the finest, as well as coarse and heavy work, being adapted to use in the finest toy work and upon heavy lumber. This machine is manufactured by Messrs. Kimball & Kimball, 639 Arch street, Philadelphia, who will be pleased to furnish any further information desired.

SCIENTIFIC AND TECHNICAL.

An interesting discussion took place recently, at a meeting of the French Academy of Sciences, on

SPONTANEOUS COMBUSTION.

M. Cosson described an accident which had occurred in his laboratory. While he was working, a portion of the boarding of the floor spontaneously took fire. The boards were in the vicinity of a register, through which the warm air from a stove four meters away on the floor below ascended. A similar accident took place two years ago, and in consequence M. Cosson had the boards adjoining the air-hole replaced by a slab of marble. The boards which now ignited adjoined the marble. The heat to which the boards were subjected was, however, very moderate, being only that of warm air at 75° F. Nevertheless, M. Cosson said the wood had undoubtedly been slowly carbonized. Being thus rendered extremely porous, a rapid absorption of the oxygen of the atmosphere had resulted, and sufficient caloric was thereupon produced to originate combustion. The danger thus disclosed, said M. Cosson, is one to which the attention of builders ought to be directed. In the instance in question, M. Cosson was able to extinguish the fire with a little water, as he was present and witnessed its beginning; but had it occurred at night, during his absence, it would undoubtedly have completed its work of destruction. M. Fay stated that at Passy, a few days before, a similar case of spontaneous fire, due to the action of the warmth from the air-hole of a stove upon the wood-work, had occurred at the house of one of his friends. Similar accidents have been known to occur in this country, and the case given above goes to show how extremely cautious builders should be.

The frequent recurrence of mine explosions makes it necessary that every detail of the appliances which serve to prevent them should be generally known. Miners should have a thorough knowledge of the merits of different

SAFETY LAMPS AND THEIR FUNCTIONS.

The qualifications of a good safety lamp have been ably summed up by Mr. Allan C. Bagot, in a paper read before the Society of Mechanical Engineers of England. As they are of general interest, we give them below: (a). In an atmosphere of fire-damp at too high a velocity, the lamp should become extinguished, and should not explode. (b). The lamp should be able to stand a high velocity without becoming extinguished, and should yet be a delicate testing lamp in the hands of the fire-trier. (c). A body of gas burning within the gauze should be capable of being extinguished at once, mechanically, without opening the lamp. The first qualification, that the lamp should not explode in an atmosphere of gas, but become extinguished, is of the utmost importance. In the Davy lamp, and all lamps constructed on the same principle, the fact of their exploding at a high velocity renders them, in the writer's opinion, quite unsuitable for coal mines; colliery managers who persist in using them must accept the responsibility appertaining to their use. On the other hand, self-extinguishing lamps on the principle of Stephenson's, are the only ones that can be used with any degree of safety where blowers of gas exist. If a mine which is worked with a Davy and Clanny lamp becomes filled with gas, it is almost a certainty

that some one of the lamps will fire the gas; whereas, if the mine is worked with self-extinguishing lamps, these all go out in succession as they become immersed in the gas.

The Stephenson lamp, which Mr. Bagot has found by experiment to be superior to the Mueseler lamp, largely used on the Continent, is self-extinguishing. It is made with a tall glass chimney, surmounted by a cap of tin, copper or brass, perforated with a number of small holes, through which the products of combustion escape, while the air necessary for supporting combustion is admitted close to the flame of the wick, through a number of small holes in the under side of the brass ring at the base of the glass chimney, thus keeping up a free circulation of air round the flame. In the modern construction of this lamp, the glass chimney is protected by being inclosed within a closely fitting wire gauze case, which extends over the cap at the top; it is thus in reality a Stephenson lamp within a Davy casing. This gauze is also carried down through the bottom ring, so that the air entering through the holes in the ring has to pass in addition the gauze before reaching the flame.

The Engineer states that a German inventor proposes to make

BOOTS WITH STONE SOLES

in the following manner: He mixes a suitable quantity of clean quartz sand with a water-proof glue, and spreads it on a thin leather sole which is employed as a foundation. These quartz soles are said to be flexible and almost indestructible, while they enable the wearer to walk safely over slippery roads.

Dr. Mensel, of Breslau, Germany, gives the following method for making

PIGMENTS FROM COAL.

Powdered coal is treated with nitric acid, or with nitrate of soda or potassa, and sulphuric acid. Then a portion of the coal will dissolve in caustic or carbonate of alkali, yielding a dark brown solution. A black residue remains behind, which may be used as a paint. The brown alkaline solution may be used at once, or a brown precipitate may be obtained by adding an acid.

Dingler's Polytechnic Journal gives a description of the manufacture of

A NEW STEAM-PROOF CEMENT.

discovered by Mr. A. C. Fox, which it is claimed is not affected by hot or cold water, nor by acids or alkalis. First, a chromium preparation is made in the following manner: 2.5 parts, by weight, of chromic acid are dissolved in a mixture of 15 parts of water and 15 parts of ammonia. To this solution about 10 drops of sulphuric acid, and, finally, 30 parts of sulphate of ammonia and 4 parts of fine white paper, are added. When about to be used, gelatine dissolved in dilute acetic acid is added.

Mr. John Bogart, Secretary of the American Society of Civil Engineers, has written letters to a large number of railways in Great Britain and Ireland, asking for details as to the experience had in those countries with

PREPARED AND UNPREPARED TIMBER.

From the returns he has compiled an interesting table, from which it appears that the sleepers are treated with creosote oil on most of the lines from which information has been received, and that this method of preservation is the only one now in use. The cost of treating averages about 23 cents for each sleeper. The amount of creosote oil forced into the wood averages about 0.82 gallons per cubic foot. Manufacturers state that the weight of creosote oil should be 8½ lbs. to the gallon of 231 cubic inches; the weight of oil forced into the wood, therefore, averages about 7.175 lbs. per cubic foot of timber. The life of the creosoted railway sleeper, as shown by the table, varies greatly, owing, doubtless, to circumstances of traffic, drainage, ballast, &c. The average life seems to be about 16 years, and the average gain from preservation is stated at from 2 to 10 years, averaging about 6 years.

The Smithsonian Institution reports, under date of the 23d inst., the

DISCOVERY OF A NEW PLANET

of the 12th magnitude. It was discovered, according to the announcement of the Observatory of Paris, by Palisa, at Pola.

Kentucky Wagon Manufacturing Co.—A strong stock company, of which Chapin Hall is president; Stephen E. Jones, vice-president and treasurer; C. B. Robinson, secretary, and Irvin H. Eddy, general manager, has been organized at Louisville, Ky., for the manufacture of farm wagons. The product of this factory will be known as the "Old Hickory" wagons. The works of the company are extensive and first-class in every particular, and their goods will be on the market, we are informed, by the 1st

of July. The factory has a capacity of 50 wagons a day.

The Isthmus Canal.

The International Congress, which was organized and called together in Paris by Ferdinand de Lesseps, the famous engineer and promoter of the Suez Canal, has just finished its deliberations on one of the most important engineering problems of the present century. Numerous enthusiastic engineers and capitalists have approached the subject, and have done much toward gaining a thorough knowledge of the topography of the country, at a great sacrifice of money and energy. In a certain measure the congress which has been sitting in judgement of the mature plans submitted, carries with it the final execution of the work, and therefore it may be of general interest to submit a short account of the several routes surveyed and proposed. Americans and the American government, French engineers, and projectors of almost all civilized maritime



FOOT POWER BAND SAWING MACHINE.

nations, have taken an active share of the work, an excellent summary of which is given in *Scribner's Monthly* for June.

On the narrowest strip of land between the two oceans almost the first American settlement was made, and in 1532, 23 years later, pioneer Spaniards established a line of communication with the Pacific coast, on the ground that to-day supports the sleepers of the Panama Railway. At an early day the Spaniards had hopes of being able to connect the harbors on both sides of the Isthmus by means of a short canal as a connecting link between the head waters of the numerous rivers emptying into these harbors. But when gold mines were discovered in Darien, Philip II ordered that all surveys and maps be put under lock and key, and that any person reviving the subject be put to death. Malte Brun, in his classification, mentions 19 distinct proposed canal routes, and French exploration has since added another. Humboldt states that about 1771 attention was drawn to the Tehuantepec route, and in 1843 M. Garela made a survey for a route near the present line of the Panama Railway.

A new era of exploration began about the year 1850, stimulated mainly by the writings of Humboldt and his belief in the use and possibility of a ship canal. Among Americans the most prominent figure in pushing forward the enterprise has been a New York gentleman—Frederick M. Kelley—who sent out surveying expeditions in 1853, 1854 and 1855. The result of these

expeditions was the conception of the Truando-Atrato route. A cut of 25 miles, of which three were to be tunneled, was to connect the river Atrato, flowing into the Gulf of Darien, and the river Truando, emptying into the Pacific by Humboldt Bay. Mr. Kelley spent two years in Europe to urge the adoption of the route, without success. In 1857 the American government sent out a surveying party under Brigadier-General Michler and Lieut. Craven, the former reporting favorably on the Atrato route, the latter adversely.

In 1863 Mr. Kelley's attention was attracted to the San Blas route, between the Gulf of San Blas and the Bayano, or Chepo River, at the narrowest neck of the Isthmus, it being there only 30 miles from ocean to ocean. His own means being exhausted, he succeeded in interesting Cyrus Butler and the late Luke T. Merrill in his plans.

In the autumn of 1863, Capt. Norman Rude, with the assistance of the natives, ran a barometrical line over the San Blas route. The following spring a surveying party was equipped, led by A. MacDougal. Beginning

on the Pacific side they found a good harbor in the Bay of Chelillo; and discovered that the Bayano River would afford perfect ship navigation for more than 10 miles with almost no improvement; and that for eight miles further the ground was admirably suited to canal purposes, crossing only one considerable stream, the Mamoni River. They were now at the foot of the Cordillera, the summit of which was found to be 1500 feet. Crossing over to the foot of the hills, on the Atlantic side, MacDougal estimated that the contemplated tunnel would be seven miles long; this was on the supposition that he was within three miles of San Blas Bay, affording a magnificent harbor, which, with its numerous islands, lay in full view before him, the land sloping gradually to the sea, with the Mandinga River some distance to the left. He attempted to triangulate the distance to the Gulf of San Blas, but hostile Indians compelled the party to beat a retreat. His report was highly satisfactory, and plans were made for a canal. Since the tide at the starting point of the canal, 10 miles up the Bayano, rose nearly 13 feet, and on the other side in San Blas only 2½ feet, the plans were made to comprise tidal locks at the extremities of the canal, to prevent the waters of the Pacific at high tide from flowing through into the Atlantic with a current troublesome to the passage of ships, and also to prevent a counter current during the ebbing of the tide. The sectional area of the proposed tunnel was a width of 100 feet and a height of 90 feet above water line 25 feet above the bottom of the canal. In 1870 Commander Thomas O. Selfridge was placed at the head of an important governmental expedition to explore the Isthmus. Among other routes, he set out to verify from the Atlantic side the San Blas survey of MacDougal. He reached the summit, and the rainy season having set in, concluded to return. He gave it as his opinion, however, without going entirely over the mountains, that the tunnel would be 10 instead of 7 miles long. Commander Selfridge then proceeded up the Atrato, and surveyed the Napipi route to Cupica Bay. He contemplated from three to 20 locks, a tunnel at least three

miles long and a reservoir and aqueduct to feed the summit level. He estimated the cost at about \$90,000,000, and the distance from ocean to ocean at 178 miles.

Between 1876 and 1879 Lieut. N. B. Wyse, an enterprising, learned and daring engineer of the French Navy, made surveys of two canal routes by way of the Gulf of San Miguel and the Tuyra River to the Atlantic, for a company of wealthy French and American capitalists. The first of these routes leaves the River Atrato, thence by the rivers and lakes Caquirri, Puquia, Cué, Paya and Tuyra into the Gulf of San Miguel. One hundred and twenty-eight miles of canal will have to be dug. There will be 22 locks, but there is no imperative need of a tunnel. The advantages are splendid ports at both ends and the ease with which the excavations can be made, owing to the nature of the ground. A serious objection is found in the fact of the difficulties inherent in the use of two systems of water supply. This route was carefully examined by Wyse, Reclus, Celler and others in 1876-77. The estimated cost is \$130,000,000, and it will require twelve years' labor.

The second scheme, closely allied to the preceding, starts from the Atlantic coast at Acanti, proceeds west to the junction of the Tuyra and Chucunagne, and terminates in the Gulf of San Miguel. Its total length is only 81 miles, and it necessitates 48 miles of excavation. The chief obstacle is found in the tunnel, 11 miles in length. It

traverses a region of great salubrity of climate. This route was examined by the international commission, composed of Messrs. Wyse, Reclus, Sosa, Lacharme, Verbrugge and others, 1876-77-78. Its cost is estimated at \$120,000,000, and the length of time required to complete it is fixed at twelve years. These two routes are what are known as the Central Darien routes.

Another important route, which possesses the advantage of low first cost, but would require more time for the passage of ships, is the Nicaragua route, in which advantage is taken of the fact that Nicaragua Lake is a large navigable sheet of water, extending to within 16 miles of the Pacific, and has a spacious outlet to the Atlantic by the San Juan River. Lieutenant Lull and Chief Engineer Menocal, both of the United States Navy, in the reports of their surveys, make the distance from Brito, on the Pacific, to Greytown, on the Atlantic, 18¼ miles, and place the cost of construction at about \$53,000,000, including the unfortunate necessity of making harbors (for no natural ones exist) at both termini. It is proposed to lock down from the lake to the Pacific, and to improve navigation on the San Juan by means of locks and dams. M. Blanchet is at the head of an association owning a concession for this route, and urged its claims before the congress. He thinks 14 locks would be sufficient, and places the cost between \$40,000,000 and \$50,000,000; but it is generally supposed that 24 locks will be necessary, and that the cost will not fall short of \$100,000,000.

Chief Engineer Menocal laid before the Committee on Technique, at Paris, plans and estimates for the Chagres route, which would cross the Continent at its narrowest point, between the cities of Aspinwall and Chorrera, near Panama. He said that on the arrival of the United States surveying expedition at Aspinwall, the first point they had considered was whether a canal without locks—that is to say, a canal at sea level—was practicable. Such a canal, they decided, would necessarily have to be the ultimate drain of a large basin, extending between Aspinwall and Panama, and the recipient of the Chagres, the Gatuna, the Obispo, the Primedado and the Rio Grande rivers, besides smaller confluent. The River Chagres would have to be received into the canal with a fall of 46 feet during the dry season and of 78 feet at times of flood, with a depth of water of 32 feet or more on the top of the dam. The great objection to the bed of the Chagres had been found to be in the fact, therefore, that the required elevation could not be kept, as during the rainy season the river rises too rapidly and too high, and the dams, which would take years to construct, might be destroyed in a single night. After mature deliberation, it had been decided to abandon the plan of a canal on the sea level, and investigations had been directed toward the location of a canal, with locks that would cross the Chagres by means of a viaduct, under which the river would have full flow. It was found that an ample supply of water could be obtained from the Chagres by an aqueduct ten miles in length. The summit level of the canal had to be fixed at 124 feet above the level of the sea, and 12 locks were necessary on either side to overcome that elevation.

On the Pacific slopes the locks would have to be located from a mile to two and a half miles apart, until the level of the swamp of the Rio Grande is reached. At that point, the level of the canal would go down to the level of tide-water, and continue so until it approached the beach of Panama, where it would be necessary to construct two tidal-locks, of 10 feet lift each, so that vessels could go in and out during any state of the tide. This canal as proposed, Mr. Menocal went on to show, would be perfectly free from surface drainage, for which ample provision would have to be made. The length of the proposed canal from Matichin to Panama would be 15 miles, and from Matichin to Aspinwall 26 miles, making the entire length of the canal 41 miles. The cost of this route Mr. Menocal estimated at \$98,000,000.

M. de Lesseps is inclined to favor the use of tunnels, while others avoid them, employing locks in their stead. Against the latter much is urged, notably in connection with the Nicaragua route, where it is feared the locks will have to be so large, in order to accommodate large vessels, that there is danger of their proving too weak under the enormous pressure.

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American Exports to European Ports.

—Mr. Weaver, United States Consul at Antwerp, has prepared for the Department of State a tabular statement of the entry tonnage of the chief ports of Europe for 1878. From the United States the total tonnage at the following ports is placed in the first column, and the tonnage in United States vessels in the second:

	Tons.	Tons.
London.....	584,723	92,105
Liverpool.....	3,170,178	320,748
Antwerp.....	438,321	43,660
Hamburg.....	206,616	22,387
Amsterdam.....	112,417	8,593
Bremen.....	635,457	36,063
Glasgow.....	269,154	9,858

The proportion is about the same at other ports. It appears from this that the tonnage of exports to Liverpool is about four times as great as to London or any other port, and about equal to (a trifling greater) the aggregate to the other six ports mentioned.

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SEE PAGE 9.

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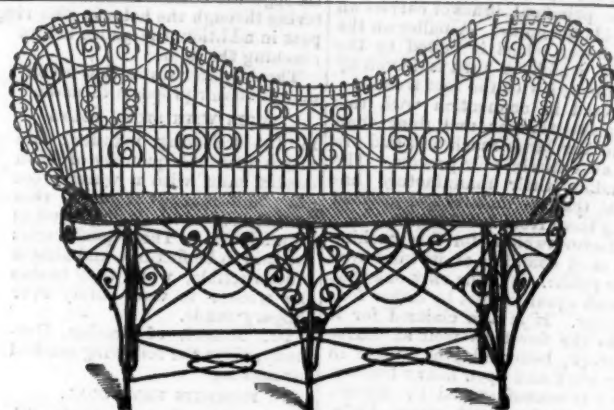
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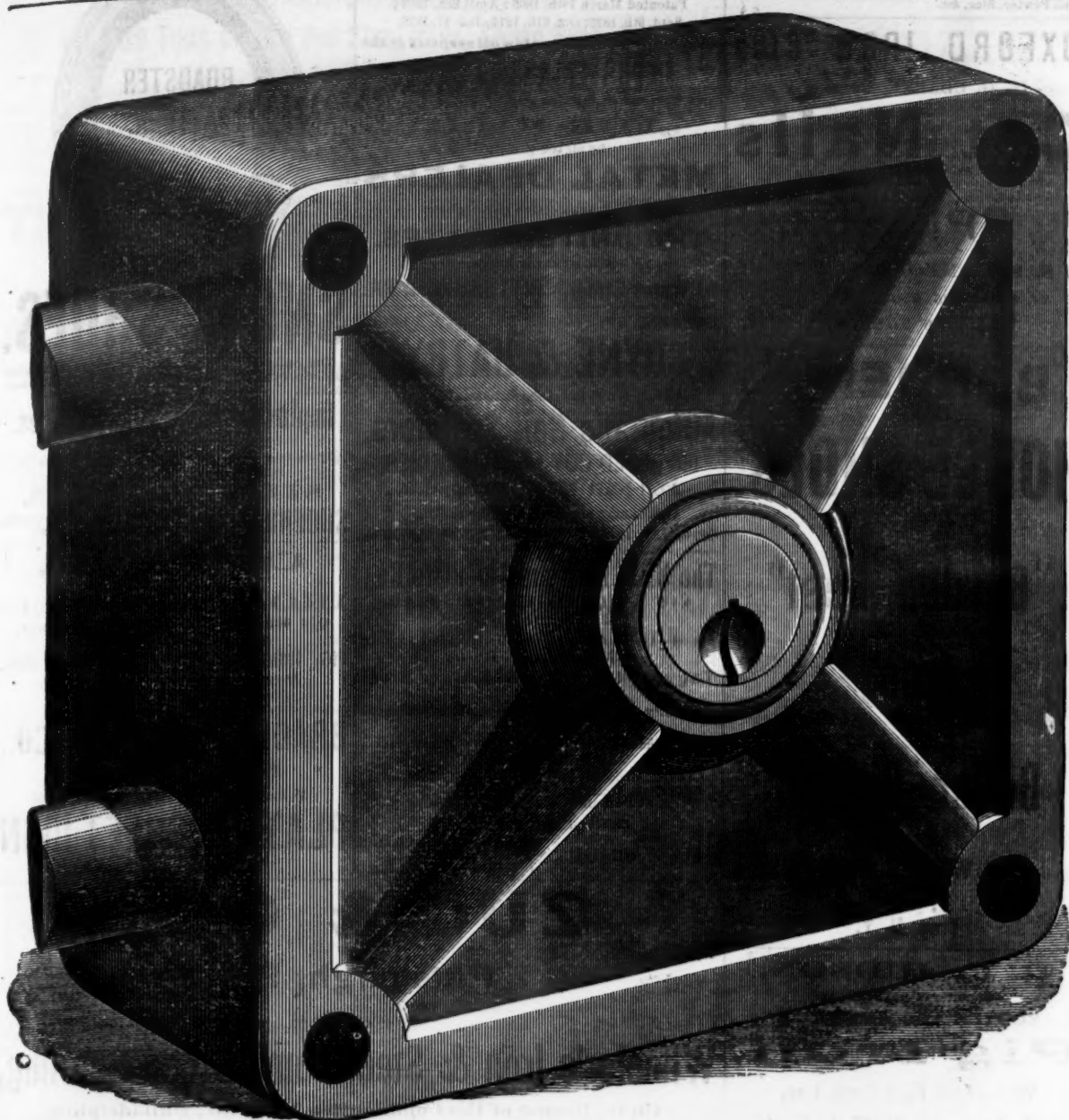
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Swedish Iron and Steel for Shipbuilding.

Complaints have frequently been made of the readiness with which iron vessels go to pieces in circumstances where wooden ships would hold together. By using steel of suitable quality as a shipbuilding material, however, an extraordinary power of resistance is attained, as will be seen from the following instances: In October, 1875, the steamer Thorer Heling, 1300 tons, built at Lindholmen, near Gothenburg, of Motala Bessemer steel, having on board a cargo of 1200 tons, stranded on Kullegrund, in the Baltic, the bottom being rocky, and the steamer resting upon it for a length of more than 100 feet amidships. She remained there 14 days, w. e. i. she was got afloat, after 400 tons of the cargo had been discharged. During the whole time, with the exception of two days, the weather was stormy and the sea high, the steamer being completely exposed; and during three days there raged a violent hurricane from the east, which rendered it impossible for any one to remain on board. When the steamer was got afloat on the 15th day she was brought to Gothenburg to discharge cargo, after which she was docked at Lindholmen. On being examined in the dock, the bottom of the vessel was found to be bent inward in wavy lines, stones and highlights in the rocky bottom having been forced into it as into a mass of lead. Although the keel, bottom piece and watertight compartments had bent more than six inches, there was not a single leak to be found. Both the keel, which was bent in various directions, and the plates could be taken out, straightened and replaced.

Another steamer, the Motala, built at Norrköping—which, on its way from Rouen to Pillau, ran aground on the Jutland coast, at the same place where the Russian screw frigate Alexander Nevsky was totally lost in 1869—gave the most extraordinary proof of tenacity. This vessel was unceasingly driven hither and thither on a bed of sand and rock for five months, from February 17, 1875, until July 26, when she was got afloat. When she was docked it was found that only 30 plates required to be taken out, straightened and replaced. The stem of the vessel also required to be straightened, but in other respects she was uninjured.

The steamer Carlund, under full steam and a speed of 10 to 11 knots, ran upon a granite rock near Gothenburg in 1869, but when taken off was found completely watertight and without a single leak.

The steamer Norden, built at Norrköping, ran upon a rock in the Baltic in 1869, and though a part of her about 20 feet in length was considerably bent in, not a single plate—not even a bolt—had given way. The same steamer, some years after, came into collision with the steamer Juno, built of Bessemer steel, at the same place. Though, according to all appearances, a catastrophe seemed unavoidable, as both vessels were under full steam, they were able after a short interval to resume their voyage to their respective destinations. In this connection the stem of the steamer Blekinge, which ran at full speed upon a rock, may be referred to. It was shown at the exhibition of 1862, and was afterward placed in the Jermyn Street Museum, London, as a remarkable illustration of the toughness of Swedish iron.

These instances are sufficient to show that the dangers which attend navigation may be reduced in an extraordinary degree by the use of the best materials in shipbuilding.

Statistics of the American Iron Trade in 1878.*

General Summary of Production During the Past Seven Years.

In nearly all of the branches of the domestic iron and steel industries which are here enumerated, there has been an increased production in 1878 over 1877; but, as will appear further on, this increase in production has been accompanied by a decrease in prices. At no time in the history of the country have prices for iron and steel been so low as they were in 1878, excepting, perhaps, in colonial days, when the price of pig iron was still lower.

Product	1872	1873	1874	1875	1876	1877	1878
Pig iron, in the blast furnaces, exclusive of the production of the Pennsylvania district	1,874,558	2,308,278	2,868,413	3,465,581	3,801,375	3,314,851	3,277,361
Cast iron, in the foundries, exclusive of the production of the Pennsylvania district	1,470,000	1,810,000	2,090,000	2,300,000	2,400,000	2,300,000	2,300,000
Wrought iron, in the puddling furnaces, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Steel, in the Bessemer and open hearth furnaces, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of castings, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of sheet piling, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire rope, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire mesh, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire cloth, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire fencing, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire netting, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire gauze, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire mesh, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire cloth, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire fencing, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire netting, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000
Iron and steel, in the form of wire gauze, exclusive of the production of the Pennsylvania district	1,000,000	1,200,000	1,400,000	1,600,000	1,800,000	1,900,000	1,900,000

THE PRODUCTION OF PIG IRON IN 1878.

The year 1878 witnessed an increased production of pig iron in the United States over the year 1877, as 1877 had witnessed an increased production over 1876, which was the year of the lowest production since the panic of 1873. The production of pig iron in 1878 was 3,277,361 tons of 2000 pounds, and from 1872 to 1878 it has been as follows: 1872, 2,854,558; 1873, 2,868,278; 1874, 2,869,413; 1875, 2,266,581; 1876, 2,093,230; 1877, 2,314,585; 1878, 2,277,361.

If a similar rate of increase be maintained in 1879, as we have no doubt it will be, the production in this year will equal that of either of the exceptionally productive years.

* From the Annual Report of James M. Swank, Secretary of the American Iron and Steel Association.

1872 and 1873; while a much less rate of increase will carry our production in 1880 above 3,000,000 tons. Joined to the reduction in stocks of pig iron which took place in 1877 and 1878, and which will be shown further on in this report, the fact is fully established that the consumption of pig iron in this country has greatly increased since 1876. This increased consumption is not wholly accounted for by the growth in the past two years in the Bessemer branch of our steel industry, rapidly as it has been developed; and it is to be noted also that the production of iron rails and all forms of rolled iron was less in 1877 than in 1876, and but little greater in 1878 than in 1876. The inference is therefore clear that, although the increased consumption of pig iron in the last two years was due partly to the activity in our steel works, it was also partly due to an improvement in the business of the foundries and machine shops of the country, and but slightly due to the iron rail mills and other iron rolling mills.

If the prices obtained for pig iron in the last two years had kept pace with the increase in production, the pig iron branch of the American iron industry would have been in a reasonable degree prosperous; but, unfortunately, we are not permitted to record a result which would have been so gratifying. Prices of pig iron declined steadily in 1877 and 1878, as they had previously declined since 1872, in which year the highest prices were attained since 1865, the last year of the war. The average yearly price of No. 1 anthracite foundry pig iron at Philadelphia from 1872 to 1878 was as follows, per ton of 2240 pounds: 1872, \$48.87½; 1873, \$42.75; 1874, \$30.25; 1875, \$25.50; 1876, \$22.25; 1877, \$18.87½; 1878, \$17.62½. Even during the dark days of 1861 the price did not fall so low as it did in 1878, the lowest average in the former year being \$18.62½ in October.

The use of coke as a blast furnace fuel has steadily increased during the past few years, but the most significant feature of this increase is the invasion by coke of districts heretofore exclusively appropriated by anthracite coal. Connellsville coke is now used in some furnaces in New York, New Jersey, Eastern Pennsylvania, and Maryland, but in every instance as a mixture with anthracite. The furnaces which use this mixture we have classed as anthracite furnaces. If an absolutely accurate classification of furnace fuels were possible, it would probably appear that more pig iron is now made with bituminous coal and coke than is made with both anthracite and charcoal combined.

The States which increased their production of pig iron in 1878 were Vermont, Connecticut, New York, New Jersey, Pennsylvania, Virginia, Georgia, Alabama, West Virginia, Kentucky, Tennessee, Ohio, Illinois, Wisconsin and Oregon. Those which decreased their production were Maine, Massachusetts, Maryland, Michigan and Missouri. North Carolina, Texas and Indiana made pig iron in 1877, but made none in 1878. None of the Territories made any pig iron in 1877 or 1878. The increased production in 1878 over 1877 was 262,776 net tons, and of this increase the share of Pennsylvania was 159,277 tons, or 72 per cent. Ohio increased her production in 1878 over 1877 only about 20,000 tons. Of the total product of 2,577,361 tons in 1878, Pennsylvania made 1,342,633 tons, or just 52 per cent. This State has but once exceeded her production of pig iron in 1878; this was done in 1872, when 1,401,497 tons were made.

Of the three States which made pig iron in 1877 and made none in 1878, the case of Indiana is remarkable. Until recently this State had eight furnaces, and it produced 39,221 tons of pig iron in 1872, falling to 15,460 tons in 1877. In 1877 the demolition of some of these furnaces commenced, and in 1878 it was continued, and is to be still further continued during the present year. The Planet Furnace, at Harmony, was torn down in 1877, and the Lafayette Furnace, at Brazil, was torn down in 1878. This year the two furnaces of the Western Iron Company, at Knightsville, are to be removed to Cleveland, Ohio. These four furnaces used the bituminous black coal of Indiana, and either Lake Superior or Missouri ores. Of the four furnaces which remain, three have used the same fuel and ores, and one has used charcoal and a large percentage of native ore. Since the beginning of the present year one of the Vigo furnaces at Terre Haute has been put in blast.

Referring to the statistics of the Pennsylvania districts, we find that the Lehigh Valley made almost as much pig iron in 1878 as it made in 1872, and more than it made in 1873. The production of the Schuylkill Valley was stationary in 1872, 1873 and 1874, and has since annually been from 30 to 40 per cent. below the production of any one of these years. The Upper Susquehanna district increased its production in 1878 over 1877 nearly 28,000 tons, and the lower Susquehanna district increased its production over 26,000 tons. The Shenango Valley decreased its production over 22,000 tons, but Allegheny County made the exceptionally large product of 217,209 tons, against 141,749 tons in 1877. In 1879 it will undoubtedly exceed the product of 1878. In Ohio the Hanging Rock district decreased its production of both charcoal and coke pig iron in 1878 as compared with 1877; the production of the Mahoning Valley was practically stationary in 1876, 1877 and 1878; the Hocking Valley produced 65,600 tons in 1878, against 23,805 tons in 1877; and the coke furnaces in the remaining parts of the State increased their production in 1878 over 1877 about 3000 tons.

In April, 1879, there were in course of erection 9 new furnaces, as follows: One at Chester, New Jersey, to make pig iron from native ore, two at Pittsburgh, one at Johnstown, one in Allegheny County, Virginia, one at Woodstock, Alabama, two at South Pittsburg, Tennessee, and one at Ogden City, Utah. But more furnaces are being abandoned than are being built, from which it follows that the number of blast furnaces in the United States is now decreasing. The following figures, representing the completed furnaces at the close of each of the last seven years, will show this:

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Scotch and American Pig Iron, Wrought, Cast and
Machinery Scrap Iron, Car-Wheels, Axles and Heavy
Wrought Iron, also old Copper, Composition, Brass,
Lead, Pewter, Zinc, &c.

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(B. G. CLARKE, Receiver.)

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HORSE SHOES.

"Burden Best"
Iron
Boiler Rivets.

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B. F. JUDSON,
Importer of and Dealer in

SCOTCH AND AMERICAN
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Wrought & Cast Scrap Iron,
OLD METALS.

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233 & 235 South St., }

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IRON, BRASS and COPPER GOODS, &c.

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Iron & Steel Boiler Plate.
Lap Welded Boiler Tubes, &c., &c.
130 & 132 Cedar Street, New York.
A full & complete celebrated Cast Steel Boiler Plates.

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PITTSBURGH.

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PATENT

Planished Sheet Iron.
Patented March 14th, 1865; April 8th, 1873;
Sept. 9th, 1873; Oct. 6th, 1874; Jan. 11, 1876.
Guaranteed fully equal in all respects to the

IMPORTED RUSSIA IRON,
and at a much less price.

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METAL DEALERS
In the Large cities throughout

THE UNITED STATES.
And at their Office,

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COYNE & HATRY,
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Automatic Nail Selectors,
IMPROVED CUT NAIL MACHINES,
And Nail Factory Supplies.

WORKS, cor. 28th & Smallman Sts.,
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The U. S. Iron and Tin Plate Co.,
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Manufacture to order

Best Refined Charcoal and Pol-
ished Sheet Iron,
Taggers Iron and Bessemer Steel
Plate,
in quality and size to suit the wants of consum-
ers. Also

BEST CHARCOAL TERNE PLATES IN SPECIAL SIZES,
FROM 10x17 TO 20x30.

Orders solicited. Inquiries promptly answered.
Address P. O. Box 24, Pittsburgh, Pa.
Works at Demmler, Allegheny Co., Pa.

Eastern Sales Agents:
ELY & WILLIAMS, { 1232 Market St., Phila.
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ZUC & CO.,
Pittsburgh, Pa.,
Manufacturers of

Wheeler's Iron & Steel Combination Shafting,
Under license of the Combination Trust Co., Philadelphia.

This Shafting is superior to any now on the market, and the attention of machinists is
particularly called to it and a trial order solicited. Prices furnished on application.

LEECHBURG IRON WORKS.
KIRKPATRICK, BEALE & CO.
Manufacturers of all grades of

FINE SHEET IRONS,
(Refined, Cold Rolled, Show Card, Stamping, Tea Tray, Polished, Shovel.)
TIN AND TERNE PLATES, made with Natural Gas as fuel.

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JOHN ROACH. AETNA IRON CO., WM. J. FRYER, Jr.
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Manufacturers of every description of Wrought and Cast

ARCHITECTURAL IRON WORK FOR BUILDINGS.
86 to 108 Goerck Street, New York.

WROUGHT IRON.
Roofs, Stairs, Floors,
Shutters and Doors, with
various fastenings.
Rolling Shutters.
Window Sashes and
Frames.
Fire-Proof Ceilings and
Partitions. Lathing.
Sky-Lights, Floor-Lights,
Book-Safe Doors.
Fire-Escape Balconies and
Ladders.
Rolled and Riveted Beams
and Girders.

BANK-Vault Doors and Safes.
Bridles, Truss Plates and
Boils, for Wood Beams.
Anchors, Clamps and Ties
for mason work.
Framing, for Slate.
Gratings, for Areas.
Corrugated Sheet Iron,
galvanized or plain.
Window Panels & Guards.
Water Tanks.
Platform Elevators,
Stores.
Etc., Etc., Etc.

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Fronts for Buildings.
Columns of every kind.
Arch Girders, with tension
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Cast Iron Beams.
Cornices.
Capitals and Bases.
Fire Rings. Ventilators.
Illuminating Tiles, for
Steps and Platforms.
Roof Crestings & Finials.
Verandahs, Balconies.
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Buckles.

Window Lintels and Sills.
Lamp Posts. Tree Boxes.
Chimney Caps. Copings.
Leader Pipes. Gutt
Spouts.
Coal Covers. Walking
Plates.
R R Signs and Gates, for
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cemeteries.
Improved Chairs, for the-
atres, with turn-up seats.
Stable Fixtures, Mangers,
Stall Guards, &c.

MOULDING SAND
Fire Sand and Clays.

FOUNDRY FACINGS
Shovels, Riddles, Brushes, &c.

WHITEHEAD BROS.
AMERICAN FACING CO.
AMERICAN IMPROVED SYRINGE, 18 inches long; diameter 1½ in.

WM. WHITEHEAD, Treas.,
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Brass Green-house Syringes and Pumps, Brass Tubes, Fine Mandrel-drawn Tubes of all sizes and
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ROBT. T. DEAKIN & CO., 500 N. 12th St., Phila.
N. B.—Tubes for sliding one within the other made to order. Send for Circular and Price List.

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A. G. HATRY,
Successor to HATRY & FRIEND,
Commission Merchant
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Bar, Sheet, Tank, Boiler, Angle, T,
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Nails & Spikes, Steel & R. R. Supplies,
WINDOW GLASS, GAS PIPE & BORAX.

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SNOW SHOES.
The only Snow Shoes in the market that abso-
lutely prevent all balling and give universal satis-
faction.

Improved Snow Shoe Shapes.
Standard Sizes.
5x7-16, 11-16x7-16, 3/4x7-16, 13-16x7-16, 3/4x7-16, 7/8x7-16,
15-16x3/4, 12 1/2, 1-16x3/4, 1-16x3/4.

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SHOENBERGER & CO., Pittsburgh, Pa.

C. KANE,
Dealer in

IRON and STEEL.
Old Rails, Wheels, Axles, Springs,
Scrap, Turnings, &c.,
PIG IRON, BLOOMS AND BAR IRON.
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BRADLEY, REIS & CO.,
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Manufacturers of every description of

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Old Rails, Axles, and Wheels bought and sold.
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The Cambria Iron and Steel Works,
Having enjoyed for over TWENTY YEARS the reputation of producing the best quality of
RAILS,
have now an annual capacity of
100,000 Tons of Iron and Steel Rails, Splice Bars, &c.
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Or J. S. KENNEDY & CO., New York Selling Agency, 41 Cedar St., N. Y.

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Manufacturers of
CURVED, STRAIGHT AND HIPPED
Wrought Iron Roof Trusses, Beams, Girders & Joists,
and all kinds of Iron Framing used in the construction of Iron Roof Buildings.
DECK BEAMS, CHANNEL, ANGLE AND T BARS
curved to template, largely used in the construction of Iron Vessels.
PATENT WROUGHT IRON COLUMNS, WELDLESS EYE BARS,
For Top and Bottom Chords of Bridges.
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REFINED BAR, SHAFTE, and every variety of SHAPE IRON made to Order.
Plans and Specifications furnished. Address,
DAVID REEVES, President.

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MANUFACTURERS OF
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PLATE & SHEET IRON,
No. 519 Arch St., Philadelphia, Pa.
Orders solicited especially for Corrugated, Gasholder, Pan and Elbow, Water Pipe, Smoke Stack, Last, Stamping, Ferrule, Locomotive Headlight and Jacket Iron.

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JAS. ROWLAND & CO.,
Kensington Iron, Steel & Nail Works,
220 North Delaware Ave., - - PHILADELPHIA,
Manufacturers of the
Anvil Brand Refined Merchant Bar Iron.
Also, the James Rowland & Co. Kensington Nails, cut from their Refined Anvil stock. Also, Plow and Cultivator Steel, Rounds, Squares, Flats, Bands and Hoop Iron.
Correspondence with Dealers solicited.

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Manufacturers of
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BAR, ANGLE, TEE AND CHANNEL IRON.
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MANUFACTURERS' FOUNDRY SUPPLIES.
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AMERICAN LEAD, ANTHRACITE, SHOVELS, BRASS "
GRAPHITE, CHARCOAL, BRUSHES, CHANDELIER "
PLUMBAGO, MINERAL, CRUCIBLES, STOVE PLATE "
J. W. PAXSON & CO. OFFICE & STORES, 514, 516 and 518 Beach St., Philadelphia, Pa.

ALLENTOWN ROLLING MILL COMPANY,
Manufacturers of
Rails, Bars, Axles, Shafting, Fish Bars (Plain and Angle), Spikes,
Rivets, Bolts and Nuts, &c. Bridges and Turn Tables.
General Office, 303 Walnut St., Philadelphia. Works at Allentown, Pa.

BOOTH, GARRETT & BLAIR,
Analytical and Consulting Chemists,
919 and 921 Chant St. (10th St. above Chestnut St.), PHILADELPHIA, PA.
Established in 1836.
Analyses of Ores, Waters, Metals and Alloys of all kinds. A special department for the
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fitted with all the apparatus and appliances for the rapid and accurate analysis of Iron, Steel, Iron Ore, Slags, Limestones, Coals, Fire Sands, &c. All analyses made by the members of the firm. Price lists on application.

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IRON BROKER AND COMMISSION MERCHANT
230 S. Third St., Philadelphia, Pa.
Boiler Plate, Tank Iron, &c.,
PIG, BAR AND RAILROAD IRON,
Old Rails, Scrap, &c.
STORAGE WHARF & YARD,
DELAWARE AVENUE ABOVE CALLOWHILL STREET,
connected by track with railroad.
Cash advances made on Iron.

Chester Iron Company's
BESSEMER ORES.
NEW PRICE LIST, March 15, 1879.
S. W. Hill, Birch Tree, Tunnel and East Cut Ores, \$2.75, f. o. b. Hacklebar (most recent analyses).
"44", "37", "24", "0357", "038", "035 phosphorus".
Upper Tunnel, George and North Veins, \$2.50.
Red "Ore", \$3.00.
J. WESLEY PULLMAN, Treasurer,
407 Walnut St., Philadelphia.

D. W. R. READ & CO.,
General Commission Merchants,
ORES, METALS, &c.
Spanish, Algerian and Domestic Ores of
Iron, Manganese, &c.
205½ Walnut St., PHILADELPHIA.

RAILROAD IRON.
T Rails,
16, 18, 20, 22, 25, 28, 30, 35, 40, 45, 50, 55, 60 lbs. per
yard.
STREET RAILS OF ALL PATTERNS,
24, 26, 28, 30, 35, 40, 45, 47, 50, 60 lbs. per yard, in
stock or made to order.
Special sections made if required.
Book of sections furnished on application.
EDWARD SAMUEL & CO.,
333 Walnut St., Philadelphia.

J. W. HOFFMAN & CO.,
Iron Merchants & Railway Equipments.
205 South Fourth St., Philadelphia.
Sole agents Glasgow Iron Co. and Pine Iron Works
manufacturers of Muck Bar and all grades of Plate
Iron. Celebrated "Glasgow" and "Pine"
brands for fire boxes and difficult flanging. Pig and
Bar Iron, Rails and all shapes in Iron. Quotations
given on Bridge and Building Specifications.

THE
STANDARD
STEEL
WORKS.
LOCOMOTIVE AND CAR WHEEL TIRES,
Manufactured from the celebrated OTIS STEEL.
BRAND
STANDARD.
Quality and efficiency fully guaranteed. Prices as
low as any of the same quality. We manufacture
Heavy and Light Forgings, Driving and Car Axles,
Crank Pins, Piston Rods, &c.
Works at Lewistown, Pa.
Office, 220 S. 4th St., Philadelphia, Pa.

The Iron-Masters'
LABORATORY.
Exclusively for the
Analysis of Ores of Iron, Pig and Manufactured
Iron, Steels, Limestones, Clays,
Slags and Coal for Practical
Metallurgical Purposes.
No. 339 Walnut St., Philadelphia.
J. BLODGET BRITTON.

This laboratory was established in 1866, at the in-
stance of a number of practical Iron Masters, ex-
pressly to afford prompt and reliable information
upon the chemical composition of the substances
above mentioned, for smelting and refining pur-
poses. The object being to make it at once a con-
venient, practically useful, and comparatively in-
expensive adjunct to the Furnace, Forge and Rolling
Mill.
CHARGES TO IRON WORKS.
For determining the per cent. of Pure Iron in
an ordinary Ore..... \$4.00
For the per cent. of Pure Iron, Sulphur and
Phosphorus in do..... 12.50
For each additional constituent of usual oc-
currence..... 1.50
For those of unusual occurrence or difficult
to determine, the charge must necessarily
depend upon circumstances.
For determining the per cent. of Sulphur or
Phosphorus in Iron or Steel..... 7.00
For each additional constituent of usual oc-
currence..... 5.00
For the per cent. of Carbonate of Lime, and
insoluble Silicious Matter in a Limestone..... 10.00
or each additional constituent..... 2.00
or the per cent. of Water, Volatile Combust-
ible Matter, fixed Carbon, and Ash in Coal..... 12.50
For determining the constituents of a Clay, Slag,
Coke, or of an Ash in Coal the charges will corre-
spond with those for the constituents of an ore.
For a written opinion or letter of instruction the
charge must necessarily depend upon circum-
stances.
Printed instructions for obtaining proper average
samples for analysis furnished upon application.

Connellsville Coke.
FRANCIS WISTER,
330 South Third Street, Philadelphia.
Best Coke for Furnaces and Foundry Use.

1872, 612; 1873, 657; 1874, 693; 1875, 713;
1876, 712; 1877, 716; 1878, 692.
There were built in 1878, or completed in
that year, three new furnaces, which, added
to the decrease above noted in the same
year, would indicate the simultaneous aban-
donment of 27 furnaces. But this would be
an erroneous inference, the exact fact being
that some of these furnaces were really
abandoned a year or two previously, but we
have not felt authorized until now to drop
them from our list. A majority of the 27
were, however, abandoned in 1878, and
many of them were dismantled in that year
or since the first of January last. Among
the furnaces which have been dismantled
since the latter part of 1877, may be men-
tioned the Planet and Lafayette furnaces in
Indiana, already referred to; Escanaba, in
Michigan, torn down, to be removed to Pitts-
burgh; the Warren Furnace, in Ohio,
burned down; the Porter Furnace, in
Ohio, torn down; and the four furnaces of
the Brady's Bend Iron Company, in Pennsylv-
ania, torn down. Doubtless we have in
our list of 692 furnaces, at the close of 1878,
some which will never again make pig iron,
but so long as there is a possibility of their
being put in blast, we feel bound to take
note of their existence. The furnaces which
were completed in 1878 were the following:
One at Plattburgh, New York, to use char-
coal; one at Ironton, Ohio, to use bitumin-
ous coal; and one in Johnson County, Ten-
nessee, to use charcoal.

The number of furnaces in blast at the
close of 1878 was 265; out of blast, 427. At
the close of 1877 the number in blast was
270; out of blast, 446. As the production
of pig iron was 262,776 net tons greater in
1878 than in 1877, it is clear, from a com-
parison of the number of furnaces in blast in
each of these years, that our furnace prac-
tice greatly improved in 1878.

In this connection it is interesting to note
the improvement in the management of our
furnaces which has taken place since 1873.
At the close of that year there were 410
furnaces in blast, and the production of the
year was 2,868,278 net tons, or an average of
6996 tons for each furnace; at the close of
1878 there were 265 furnaces in blast, and
the production of the year was 2,577,361
tons, or an average of 9726 tons for each fur-
nace. These averages are, of course, only ap-
proximations to the actual results, the num-
ber of furnaces in blast in any one year vary-
ing with the months, and possibly with the
days of the year; but the basis of calculation
is the same in each of the two years taken,
and the averages obtained are, therefore, in
a comparative sense correct. They indicate
that the average production of the furnaces
in blast in 1878 was almost 40 per cent.
greater than that of the furnaces in blast in
1873. The superior results obtained in 1878
were due in part to the use of a larger pro-
portion of large furnaces, in part to greater
skill in all the details of furnace manage-
ment, and in part to the increased use of
better ores and of Connellsville coke.

The following table shows, in tons of 2000
pounds, the production of pig iron in the
United States from 1854 to 1878, classified
according to the fuel used:

Years.	Anthra- cite.	Char- coal.	Bitumi- nous.	Total.
1854.....	330,435	342,298	54,485	727,218
1855.....	381,660	339,923	62,390	783,973
1856.....	443,113	370,470	69,554	883,137
1857.....	398,365	338,321	77,431	784,117
1858.....	351,430	288,313	38,351	708,094
1859.....	471,745	284,041	84,841	840,627
1860.....	510,211	278,331	122,228	910,770
1861.....	469,250	195,278	127,037	791,565
1862.....	470,315	185,650	130,657	786,622
1863.....	577,638	212,035	157,961	947,634
1864.....	684,018	241,853	210,125	1,135,996
1865.....	479,358	262,342	189,682	931,382
1866.....	749,267	338,356	268,396	1,355,919
1867.....	708,638	344,341	318,647	1,471,626
1868.....	803,000	370,000	340,000	1,513,000
1869.....	971,150	392,150	353,341	1,716,641
1870.....	939,000	385,000	370,000	1,694,000
1871.....	956,608	385,000	370,000	1,711,608
1872.....	1,369,812	500,587	984,159	2,854,558
1873.....	1,312,754	577,620	977,904	2,868,278
1874.....	1,502,144	578,557	910,712	3,091,413
1875.....	958,546	410,920	947,545	2,266,981
1876.....	794,578	308,649	990,009	2,093,236
1877.....	934,797	317,843	1,061,945	2,314,585
1878.....	1,092,870	293,399	1,191,092	2,577,361

Included in the aggregate pig iron pro-
duction of the country in the past few years
is the small quantity of spiegeleisen which has
been produced. The number of net tons of
spiegeleisen produced in 1878 was 10,674,
against 8845 tons in 1877, 6616 tons in 1876
and 7832 tons in 1875. Only Pennsylvania
and New Jersey made spiegeleisen in 1878—
the Bethlehem Iron Company and the Cam-
bria Iron Company in the former State, and
the New Jersey Zinc Company in the latter
State.

At the close of the year 1874 a systematic
attempt was made for the first time to col-
lect the statistics of stocks of unsold pig iron
in the hands of makers or their agents. The
new departure was so well received that but
little difficulty has since been experienced in
annually collecting these statistics. The
figures for that year and for the years which
have intervened are given below. They
represent only unsold stocks at the close of
each year in the hands of makers or their
agents, and do not embrace stocks that have
been bought on speculation, imported, or
held by consumers. Tons of 2000 pounds
are used: 1874, 795,784; 1875, 760,908;
1876, 686,798; 1877, 642,351; 1878, 574,565.

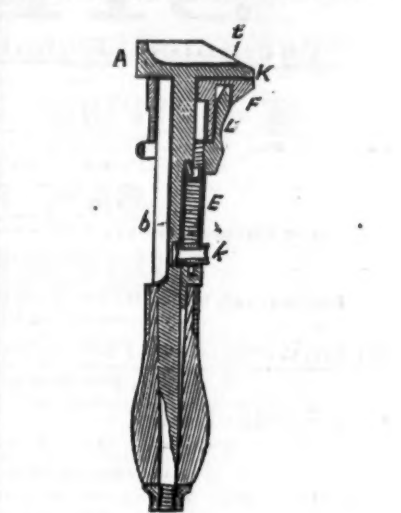
A steady decrease in the quantity of pig
iron unsold at the close of each of the past
four years is here observable. As hypothe-
sized stocks and stocks held by creditors
passed generally into the hands of consum-
ers last year, as purely speculative move-
ments were trifling and imports were small,
and as consumers have usually bought only
as their necessities required, it will be seen
that the reduction of makers' stocks at the
close of 1878, and the increased production
of the year (both of which we were able to
announce early in January), were exceed-
ingly hopeful signs for the pig iron branch
of the American iron industry, because they
indicated increased consumption and com-
paratively bare markets, and to these facts
may undoubtedly be attributed the present
steadiness in prices.
(To be continued.)

The Population of the United States.
The approaching tenth census in 1880 will
be looked for with much interest. It appears
that the population of the United States in
1870 was 38,558,000. The rate of decennial
increase, from the formation of the Govern-

ment down to 1870, was remarkably uniform.
From 1790 to 1860 it varied only between
32½ (1830 to 1840) and 36½ per cent. (1800
to 1810). Between 1860 and 1870 it sank to
22½ per cent. There was in that decade
very little immigration, and a very large
destruction of lives through the civil war.
If the increase from 1870 to 1880 should be
only 25 per cent., the population will be
more than 48 millions. Professor Elliott, of
the Statistical Bureau, estimates it at 50,-
858,000. Of European States, Russia alone
now exceeds the United States in population;
she has, exclusive of her Asiatic territory,
75 million people. Before the century ends
this country will doubtless have exceeded
this. Of its vast territory of more than
3,000,000 square miles, only a fourth is to
any great extent under cultivation. The
center of population is moving steadily west-
ward. In 1800 it was on the meridian of
Washington; in 1840 of Pittsburgh; in 1870
of Cincinnati; and in 1880 it may be ex-
pected to reach Indianapolis.

New Patents.
We take the following abstract of new
patents, recently issued, from the official
record:

WRENCH.
212,760.—To Lory S. Starrett, Athol,
Mass.—Feb. 25, 1879.—Improvement on
Letters Patent No. 190,636, dated May 8,
1879.—1. In a wrench, the combination,
with a recess, b, in the front of the bar, and
the short screw E, having a milled head, k,
of the jaw F, provided with a recess,
K, for the reception of the end of the half-

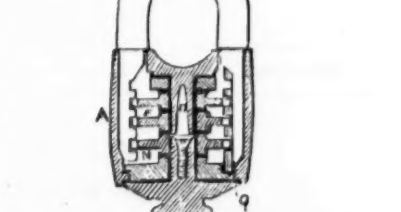


nut brace L, which is pivoted in said
recess.
2. In combination with the stationary
jaw A of the wrench-stock B, having the re-
cess b and short screw E, the movable jaw
F and brace L, pivoted in a recess K, in said
jaw, and the spring t, seated in the brace
and bearing against the recess K.

PERMUTATION PADLOCK.
212,780.—To Nestor A. Young, Haldsburg,
Cal.—Feb. 25, 1879.—1. The case A, with
its open bottom, and having the openings B
at the top to receive the locking-bolt, said
case having the spindle D formed with it,
and projecting inwardly from the top to re-
ceive and guide the tumblers E indepen-
dently of the closing and dial disk and
driver.

2. The case A, with its inwardly-project-
ing spindle D, upon which the tumblers E
turn independently of the closing-disk, in
combination with the curved locking-bar C,
with its unequally-shaped slotted legs.

3. The dial and closing-disk L, with its
stem M, split as shown, and provided with



the conical or tapering screw, in combina-
tion with the independent tumbler and
driver N.

4. The closing-disk L, with its stem M and
outer tumbler or driver, N, secured and
adjusted as shown, together with the loose disk
P, having the projection Q, in combination
with the case A, with its slots R and grooves,
whereby the dial is locked in place.

5. A permutation padlock consisting of
the outer case, A, with the locking staple C
and the closing dial-disk L, said dial-disk
having the driver N and the locking-disk P
mounted upon it, while the tumblers E are
supported independently upon the spindle D
within the case A, whereby the dial may act
upon the tumblers when in place, and be re-
moved without the tumblers.

210,392.—Sand-Core Molds.—S. Jarvis Ad-
ams, Pittsburgh, Pa.—Dec. 3, 1878.

Packs sand in core-box by jarring; ro-
tates sand reservoir to strike off sand; re-
moves reservoir and ring supporting it on
the core-box. In enlarged cavity of mold
fits a divided molded ring. To place core in
mold, insert a rod into the mold, its end
resting in a core-print at bottom of mold.
Over this rod slides core, having a central
tube. Flange of core centers upper end of
core. Wedging sand packed into recess of
core flange.

210,393.—Methods and Apparatus for Form-
ing Molds for Casting.—S. Jarvis Adams,
Pittsburgh, Pa.—Dec. 3, 1878.

The base of the core-box may be made
open, and a jarring block used to hold it,
center the wires, and take the force of the
blow.

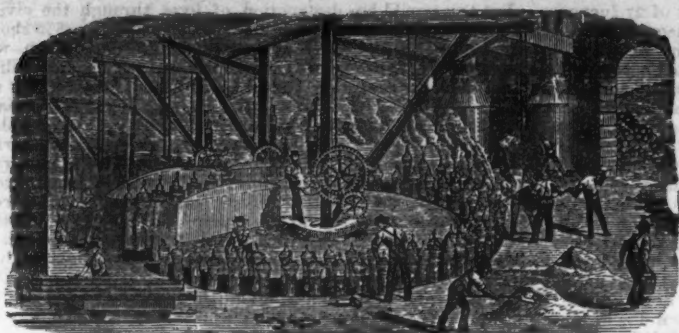
210,536.—Feed-Water Heaters.—Edward
Huber, Marion, Ohio.—Dec. 3, 1878.

210,616.—Manufacture of Railway Rails.—
Bernard C. Lauth, Pittsburgh, Pa.—Dec.
10, 1878.

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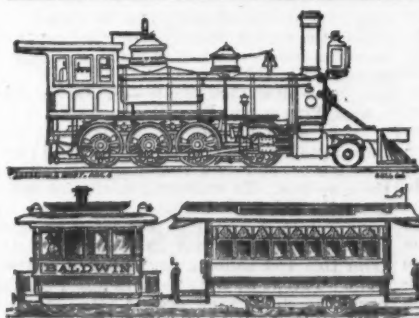
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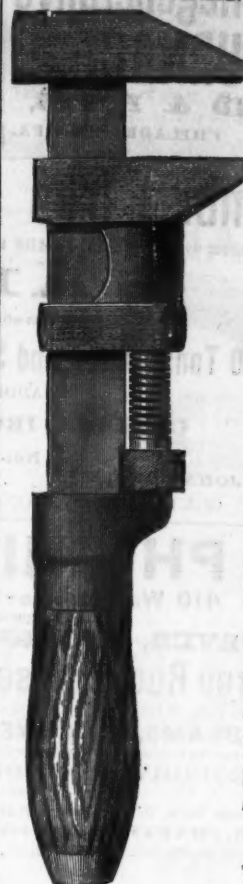
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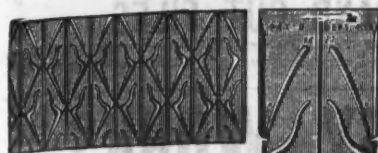
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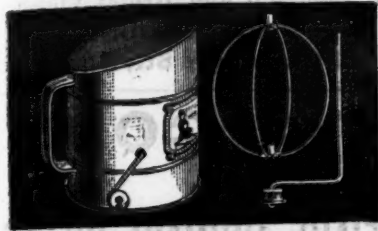
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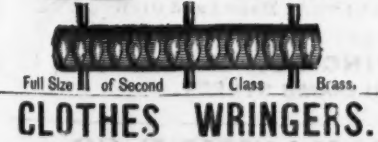
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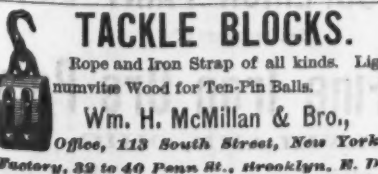
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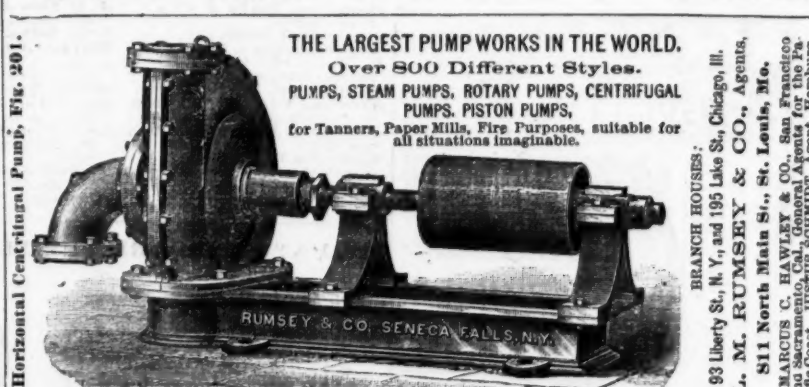
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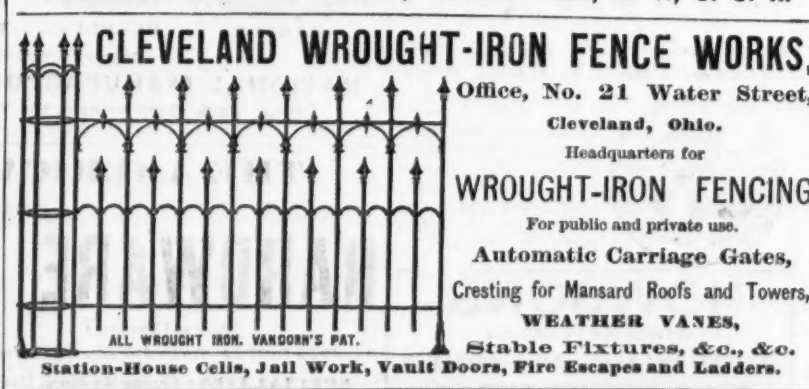
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Asa Packer.

Hon. Asa Packer, president of the Lehigh Valley Railroad, a man who has done much for the development of the coal and iron resources of Pennsylvania, died on the 17th inst., at Philadelphia. A history of his life will be of interest, as it well exhibits the difficulties overcome and the success achieved by vigilant enterprise and shrewd business management.

Asa Packer was born at Mystic, Conn., December 29, 1805. His parents were poor, and his early education was confined to what was taught in the rude district schools of those days. At the age of seventeen he started out to seek his fortune. Carrying over his shoulder a small bundle containing all his worldly possessions, the plucky lad walked the entire distance from his birthplace to Brooklyn, Susquehanna County, Pennsylvania. His cousin, Edward Packer, living there, was a house carpenter, and with him Asa learned that trade and became a first-rate workman. When the time of his apprenticeship was out he went to New York, where he worked at his trade for a year. He did not like the city, however, and returned to Susquehanna County, and settled in Springville township. There he worked at his trade, and there, on the 23d of January, 1828, he was married to a poor farmer's daughter, Sarah M. Blakslee, who survives him. The young couple spent the next four years in farming, having rented a farm which had formerly been worked by Mrs. Packer's father. But the crops were poor and markets distant, and at the end of four years they were as poor as when they began. In the winter of 1833, hearing that men were wanted to run coal boats on the Lehigh Canal, Mr. Packer hitched his one horse to a jumper and drove to Mauch Chunk, where he made an engagement for the summer and went home to settle up his affairs. In the spring he returned to Mauch Chunk, where he became the commander of a canal boat. He soon afterward contracted for another boat, which he placed in charge of his brother-in-law, James I. Blakslee. During the summer he moved his family to Mauch Chunk, where his home has since been. At the end of two years he was able to retire with some capital from active participation in the boating business, but retained an interest therein. He bought a small store, putting Mr. Blakslee in as manager, while he engaged in canal boat building. He was prosperous both in the store and the boat-yard. In a few years he placed in his store at one time a stock of goods which cost him \$25,000, which was unprecedented in that region in those days. He took large contracts for building locks on the upper Lehigh, which he finished in 1839, with large profits. Mr. Packer was then counted a rich man. In partnership with his brother Robert, in the following year, he took heavy contracts from Stockton & Stevens, of New Jersey, for building boats at Pottsville, to be constructed for the direct shipment of coal to New York. It took three years to complete these contracts. Mr. Packer then engaged in mining and shipping coal from the Nesquehoning and other mines, and thenceforward uninterrupted prosperity attended him. The Delaware, Lehigh, Schuylkill and Susquehanna Railroad Company, which afterward became the Lehigh Valley Railroad Company, was incorporated by an act of Assembly passed April 21, 1846. There was much opposition to the scheme in the Legislature, and capitalists seemed to have but little faith in it, for it was not until the 2d of August, 1847, that enough subscriptions to its stock could be secured for a beginning. At that time 5002 shares had been taken, letters patent were issued and the first election for officers was held in October following. During the next four years, however, little was done except some surveys and the grading of about one mile immediately below Allentown.

On the 31st of October, 1851, Asa Packer bought nearly all the stock which had been subscribed, and, with a view to a prompt construction of the road, began to obtain additional subscriptions. From that time forward the history of the Lehigh Valley Railroad and the history of Asa Packer are inseparably connected. Robert H. Sayre was appointed chief engineer of the railroad company, and he completed the survey and location of the line in June, 1852. On the 27th of November of that year Mr. Packer took the contract for building the railroad from Mauch Chunk to Easton, connecting there with the New Jersey Central and Belvidere Delaware railroads, and thus furnishing outlet to its trade to New York and Philadelphia. Judge Packer agreed to receive as payment for this work the company's stocks and bonds, and work was begun at once at Mauch Chunk and Easton. The name of the company was changed in January, 1853, and James M. Porter was elected president. Judge Packer prosecuted this work with great vigor, overcoming the most formidable obstacles in making the roadway at different points through the rocky bluffs. The work was greatly retarded during the summer of 1853, owing to the prevalence of cholera along the whole line. This enterprise came near sweeping away Judge Packer's entire fortune. The public had not sufficient faith in its success to make its securities sufficiently available for the contractor's needs; but valuable aid was rendered by some gentlemen connected with the New Jersey Central Railroad in the purchase of its stocks and bonds, and the Camden and Amboy Railroad Company loaned Judge Packer its securities. With this assistance he was able to complete his great undertaking, and on June 11, 1855, the road was opened for passenger traffic from South Easton to Allentown, and two trains ran daily until Sept. 12, when the road was opened for travel to Mauch Chunk. Up to this time the road was operated by Judge Packer with rolling stock hired from the New Jersey Central Railroad Company. The road was accepted from the contractor Sept. 24. The net profit of the road during the first three months of its operation was \$2781.62. The main office of the company was removed to Philadelphia early in 1856, and on this account Judge Porter declined a re-election, and on Feb. 5 William W. Longstreth was chosen president, but resigned in

the following May, when J. Gillingham Fell was elected to fill the vacancy. Mr. Fell resigned in 1862, and Judge Packer was elected in his stead and held the office for two years, when he resigned and was succeeded by Mr. Longstreth. In 1866 Mr. Packer was again elected president, which office he continued to hold down to the time of his death.

The great rival of the Lehigh Valley Railroad Company was the Lehigh Navigation Company, which had a railroad from White Haven to Wilkesbarre, where they connected with their Lehigh Canal. Judge Packer proposed to prorate freight with this company, but his proposition was refused, and the Lehigh Navigation Company extended their road, the Lehigh and Susquehanna, to Easton. In order to get a northern outlet, the Lehigh Valley Railroad Company incorporated with itself the Beaver Meadow Railroad and the Penn Haven and White Haven Railroad, by which it got a connection to White Haven, and in the same year, 1865, contracts were let for the extension of the road to Wilkesbarre, to which point it was opened early in 1867. In 1866 Judge Packer had purchased for the Lehigh Valley Railroad Company a controlling interest in the North Branch Canal, extending from Wilkesbarre to the New York State line, a distance of over 100 miles, with a charter authorizing the company to change the name to the Pennsylvania and New York Canal and Railroad Company, and to build a railroad the entire length. In September, 1869, this road was opened to Waverley, its northern terminus, the whole distance from Wilkesbarre being 105 miles. In 1871 the company made a perpetual lease of the Morris Canal and Banking Company, by which it came into possession of a line of canal 102 miles long, extending from the terminus of the road at Phillipsburg, opposite Easton, to Jersey City, giving it an independent outlet for its coal trade to New York. Its only railroad connection at Easton to New York, however, was the New Jersey Central Railroad, and the company made a lease of the Lehigh Navigation Company's railroad, canal and mines, and refused to carry freight for the Lehigh Valley Railroad at terms at which it could compete with its rival. Mr. Packer, therefore, built the Easton and Amboy Railroad, running across New Jersey, and giving him an independent outlet to tidewater. This road, which was opened in 1876, cost \$10,000,000, was paid for in cash, and all its stocks and bonds are owned by the Lehigh Valley Railroad Company. The company have also connections to Geneva, on the New York Central, by the Geneva, Ithaca and Sayre Railroad, and to Erie by a third laid on the New York and Erie Railroad in 1876. Besides the connections mentioned, the Lehigh Valley road has by merger or purchase obtained the control of many minor roads tapping the coal and iron fields of the Lehigh and Wyoming valleys. By Judge Packer's foresight, sagacity and courage these great enterprises were mainly brought about. He took no stock in distant enterprises, like gold or silver mines, but confined all his investments to the territory traversed by his road, so that his mines and his railroad should mutually benefit each other. His wealth is estimated all the way from \$10,000,000 to \$20,000,000. He owned 25 per cent. of the entire capital stock of the Lehigh Valley Railroad Company, besides vast private interests in coal and iron.

Judge Packer was the founder of the Lehigh University, which was formally opened Sept. 1, 1867. His original endowment in this institution was \$50,000 and a tract of land containing 56 acres, and he subsequently made liberal donations at various times. Last year he erected there a magnificent library building at a cost of \$70,000, which is dedicated to the memory of his daughter, Mrs. G. B. Linderman, who died a few years ago. This library has shelf capacity for 60,000 volumes, is built of stone, with gray stone front, trimmed with Connecticut granite. Packer Hall, the principal university building, is of stone, 213 feet long, and is a very handsome and complete edifice. It stands on a gentle slope of the Lehigh Mountain range, in the midst of a park of forest trees, and commands a view for 20 miles.

Steel Art Castings.—At the recent meeting of the British Iron and Steel Institute, various art castings in steel were exhibited by Hadfield's Casting Company, Hecla Foundry, of Sheffield, where various art reproductions in steel excited great interest among metallurgists, it having previously been deemed impracticable to cast such articles in steel. These art reproductions illustrate some of the latest triumphs in the art of steel casting. One of these antique pictures in steel was a repousse shield, by Benvenuto Cellini, the famous artist in metal of the sixteenth century, and was supposed to represent the siege of Troy. Four other pictures represented the elements—earth, air, fire and water. The bas-reliefs were copies from the house of Henry the Fourth at Paris. Another represents the Seasons—spring, summer, autumn and winter. Another subject was children at play, and another an eastern subject. These pictures were after the style of the French bronzes shown at the late Paris Exposition, and were greatly admired by experienced and practical steelmakers, who know how difficult it is to obtain round castings in steel.

Commercial Travelers in Texas.—Commercial travelers to the Southwest are highly indignant at the action of the Texas Legislature in imposing a special tax of \$200 on each of them; and a convention to take united action against the measure was held recently at Dallas. The commercial travelers propose to take the matter into the courts. They claim that the action of the legislature is unconstitutional, inasmuch as it virtually imposes a duty upon interstate commerce. In this claim they are probably incorrect. The bill, it is understood, imposes a like tax of \$200 upon Texas drummers, and so does not discriminate against those of other States. But there are comparatively few travelers for Texas commercial houses, and the bill is understood to have been aimed principally against those of St. Louis.



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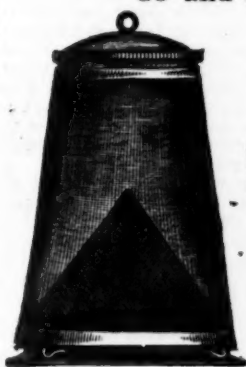


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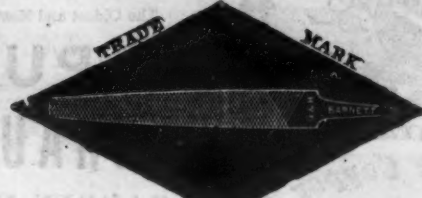
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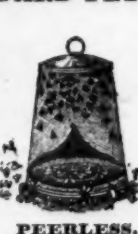
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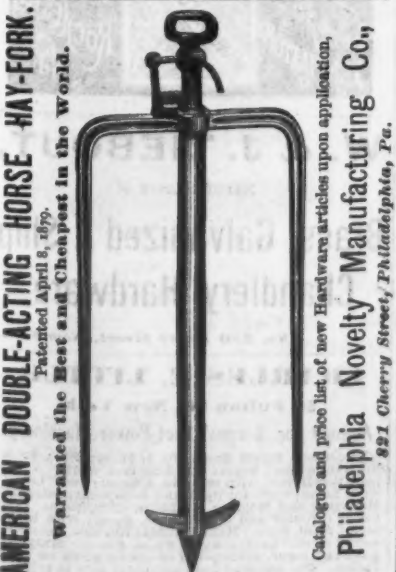
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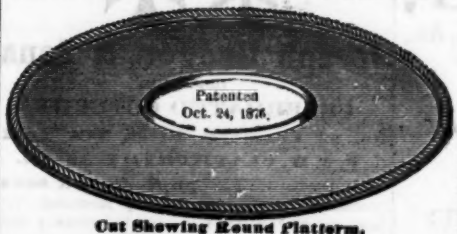
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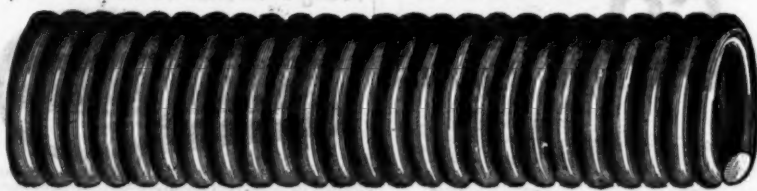


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The properties of these wheels are such that they can be used with great advantage and economy for cutting, grinding, and finishing Wrought and Cast Iron, Chilled Iron, Hardened Steel, Slate, Marble, Glass, etc. These wheels are extensively used by manufacturers of Hardware, Cutlery, Edge Tools, Plows, Saws, Stoves, Fire Arms, Wagon Springs, Axles, Skates, Agricultural Implements, and small Machinery of almost every description.

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B represents that part of the packing which, when in use, is in contact with the Piston rod. A the elastic back, which keeps the part B against the rod with sufficient pressure to be steam tight, and yet creates but little friction.

This Packing is made in lengths of about 30 feet, and of all sizes from 1/2 to 1 1/2 inches square. JOHN H. CHEEVER, NEW YORK BELTING & PACKING CO., 37 and 38 Park Row, New York. Treasurer.



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Roller Tube Expanders and Direct Acting Steam Hammers.

Communications by letter will receive prompt attention.

Jacks for pressing on Car Wheels or Crank Pins made to order.

INDUSTRIAL ITEMS.

MAINE.

The shovel handle factory at Limerick is turning out from 400 to 500 dozen handles a week.

The Portland Company are employing about 200 men, and are engaged on orders from the Portland Water Company for iron water pipe, and from the Forest City Sugar Refinery and the Portland Dry Dock Company for boilers. They have just completed a cast-iron lighthouse, and are now building a cast-iron pier for the Lighthouse Department.

The Dirigo Shovel Handle Company are making large scales of their patent handle, which they manufacture at their New Portland factory.

VERMONT.

A Washington dispatch of recent date states that the contract for supplying scales for the Indian Bureau has been awarded to E. & T. Fairbanks & Co., of St. Johnsbury.

MASSACHUSETTS.

The Gilbert & Barker Manufacturing Company, Springfield, are turning out more large gas machines than ever before, and orders are coming in rapidly and are waiting to be filled. These machines have been supplied to the Kansas State Penitentiary at Lansing, and to the Asylum for the Insane at Topeka. One is now being built for a hotel in process of construction at Fort Lee, on the Hudson, also one for a hotel at Newport, R. I.

The vacation at the Waltham Watch Factory will probably begin June 13, and will be much shorter than usual.

Business is brisk in the brass shops at Haydenville. Some 230 men are employed in this branch of industry.

Taunton's new foundry will be known as the "Champion Stove Foundry."

The Ames Company, of Chicopee, will soon resume work on their large contract for swords for the Turkish government.

The long pending suit of A. T. Servin, of Lenox, to recover \$600,000 for alleged damages to the Lenox Plate Glass Company by the purchase of the cryolite business from William E. Dodge, of New York, representing the Pennsylvania Hot Cast Porcelain Company, has been settled by counsel. It is understood that Mr. Dodge pays Servin \$8500, probably about the amount it would cost Mr. Dodge to defend the case in the second trial, which was expected to come off during the September term.

CONNECTICUT.

The Bradley & Hubbard Manufacturing Company are just completing important improvements and additions to their factory buildings at Meriden.

The Johnson Railway Heater Company, capital, \$300,000, and the Peerless Heater Company, capital, \$300,000, have been formed in Putnam since May 1.

NEW YORK.

The Crown Point Iron Company have elected the following directors: John Hammond, of Mineville; Le Grand B. Cannon and Moses Taylor, of New York; Thomas Dickson, of Scranton, and E. W. Hall of Whitehall.

The J. & J. Rogers Iron Company, of Ansonia, have elected H. D. Graves, president; H. W. Stetson, vice-president, and B. E. Wells, secretary.

The Malleable Iron Works Company, of Oriskany, have decided to move their works to Rome, and have begun to erect buildings in the latter place. These are to be four in number, and 150 x 60 feet. From 100 to 150 men and boys will be employed.

The Rome Iron Works are again in operation. They are running double turn, with all their furnaces on. They have lately received some large orders for rails, among others, one from the Northern Pacific Railroad.

The Rome Merchant Iron Mill is working double turn. It is turning out more bar, guide and hoop iron than ever before.

The new pistol factory recently established at Rome is in full operation.

PENNSYLVANIA.

The anthracite blast furnace at Glendon, belonging to the late Peter Uhler, of Easton, is to be sold at public sale, at Easton, on the 26th of June. The furnace has a diameter of bosh of 14 1/2 feet, and is 70 feet high with closed top. The plant embraces a low-pressure condensing engine, built by I. P. Morris & Co.; 8 boilers, and 2 Kent hot-blast ovens.

The Philadelphia Bridge Works recently shipped 10 iron truss bridges from 7 to 15 feet in length, built at their establishment, at the eastern end of Pottstown, for the Caibairu and Esperito Railroad, Cuba.

The Durham Iron Works, located at Riegelsville, owned by Messrs. Cooper & Hewitt, and managed by B. F. Fackenthal, Jr., their superintendent, are now in successful operation, having been put in blast May 13. The product on Thursday, May 22, was 62 1/2 gross tons of foundry iron, and for the week ending May 24 it was 403 gross tons, which is the largest product ever made at this furnace.

The pig iron market shows a gratifying improvement. Furnace operators are not as eager to sell their iron at ruling prices as they were 90 days ago.—Sharon Herald. Leibrandt & McDowell are preparing to put the Moselem Furnace in blast soon, and are providing stock.

The new roaster, recently erected in the stock house of No. 2 furnace, Birdsboro, is in full operation and working finely.

Extensive repairs are being made at the Crane Iron Company's furnaces, in Catawagus. No. 3 furnace is being torn down and will be rebuilt on a larger capacity. The other furnaces will also be repaired.

The city of Altoona is said to have a cheerful outlook, and is fast recovering from the financial straits it was in some time ago. The shops of the Pennsylvania Railroad at that point are running on full time, and \$100,000 a month are paid out by the company to its employees in that city. The remainder of an old debt of \$12,000 has been paid off, and business has assumed a decidedly brisk appearance.

The repairs at the nail-plate mill of the Pottstown Iron Company having been completed, work was to be resumed in the mill and in the nail factory on Monday.

William D. Elliott, of York, has purchased the Novelty Iron Works, of Lock Haven.

The Montgomery Furnace, at Port Kennedy, which has stood idle since July, 1876, will blow in next month.

The Eagle Iron Works, Bellefonte, are to be run to their full capacity.

The Franklin Iron Works, of Port Carbon, are busy, employing at present about 70 skilled mechanics.

There are now in blast 11 blast furnaces out of a possible 30 in the Shenango Valley, and 6 rolling mills out of a possible 9. By the last of June, if there is no trouble between employer and employed, the totals will be increased.

Kimberly, Carnes and Co., have paid the first installment of their composition with their creditors.

At Newcastle the sheet mill is on double turn, Aetna mill, puddle mill and all the finishing departments that can be supplied with iron, double turn. Plate mill and nail factory full time. Both the Aetna, Red Jacket and Clara furnaces running and working off satisfactorily.

The Mauch Chunk Democrat of the 17th says the stock of the Bethlehem Iron Co. is steadily tending upward. The Moravian congregation of Bethlehem, on Wednesday of last week, sold 380 shares of stock at \$45 and a fraction per share. This is an advance of more than \$30 per share within 18 months.

At Johnstown the new blooming mill is running regularly. It rolls an 18-inch ingot, weighing over two tons, into from six to eight-rail bloom. The foundations for the new blast furnace (No. 6.) have been laid, and the bricklayers are at work on the buildings. The two 20-ton Pernot furnaces are nearly completed. It is expected they will be in operation some time during the summer. The new horse-shoe machine is in operation making steel shoes. The puddling and the iron rail mills are also running steadily, and, in fact, the whole works is as busy as ever it has been.

"Tubal Cain," in the Sharon Herald of the 23d instant, says: At the Old Mill, for the week ending May 17, puddle, guide, hoop and sheet mills double turn, bar and plate mill single turn, nail factory and both spike machines on. At the Stewart Iron Works, Furnace No. 1 working up to its average; this furnace is something over a year in blast, and will show good 300 tons of iron for every week. In Sharpsville, Mount Hickory No. 2 making up to 45 tons a day No. 1 iron. Work progressing on No. 1 as rapidly as is possible.

PITTSBURGH AND VICINITY.

It is reported that Krupp, of Essen, is to make the steel shaft for a tow-boat about to be built for W. H. Brown & Co., of this city. The shaft is to be delivered here in September.

The Pittsburgh Car Works, at Torrens Station, which have been operating on half time for two months past, have started up full time.

Jas. MacNeill & Bro. have just completed a smelting furnace for works at Leadville, Col.

The firm of James L. Reese & Co. are fitting up new boat machinery for parties in South America.

D. W. C. Carroll & Co. report business steadily improving. Their works are running full time, with a full complement of men. They have a number of new contracts and several others offering them.

The Baldwin Carbon Breeze Co. have just shipped two castings, weighing 750 pounds each, to the Cambria Iron Works, at Johnstown.

H. D. McKnight & Co.'s Eclipse Steam Pump Works have been awarded the contract to furnish six new pumps for the Solar Oil Works, at Williamsport.

Mr. Stuts expects to have his coal washer shipped to Colorado this week. The washer and crusher is being made by Mackintosh, Hemphill & Co.; the boilers by Riter & Conley; the engine, 14 by 30 inch horizontal, large enough for two washers, by James Hill & Co., Allegheny; and the pumps, two in number, by Thompson, Epping & Carpenter. The machine, it is expected, will crush and wash about 6000 bushels of coal per day.

OHIO.

At Steubenville the Jefferson Mill continues on single turn. The Alacana Mill is still running. The Acme Glass Works are also in full blast, and are now manned with a Pittsburgh crew.

The Fulton Foundry Co., Cleveland, are about to begin the manufacture of the Alden crusher and pulverizer, the suits with the Blake Crusher Co. having been settled.

A company of four manufacturers from the Canton Cutlery Works will open the Buckeye Cutlery Works in Alliance, June 15. Alliance citizens agree to subscribe \$300 for the first year's rent of a brick building for the use of the manufactory. By the terms of the arrangement not less than 15 laborers are to be employed for one year on pocket cutlery. Possibly 40 employees may be kept at work.

The articles of incorporation of the Cleveland Bridge and Iron Company have been filed. The business of the company will be the erection of bridges and other structures, and the amount of capital employed will be \$50,000.

The Cuyahoga Iron Works have completed two fly-wheels of 30 tons for the Union Steel Works of Chicago.

The Pine Grove Furnace will commence this year's blast on the 1st of June.

There is a movement on foot to revive the Ironton Hoe Factory.

The Monitor Furnace is now in blast making from 7 to 9 tons of No. 1 iron.

The Ohio Furnace has fired. She expects to make her iron on 120 bushels of charcoal to the ton this blast.

Repairs at the Etna Furnace are progressing rapidly. The hearth is finished and work on the inwall is going on.

Some important sales of iron have occurred in the past couple of weeks. Nearly the entire year's blast, which the Lawrence Furnace is just entering upon—about 2500 tons cold blast, has been placed. Over 700 tons of Monitor, which is about half of the undisposed product of that furnace this year, has been sold, and the remainder is in a fair way of being placed. Also, 1000 tons of warm-blast which the Grant Furnace is now turning out, has already been placed with

Cutlery.

FRIEDMANN & LAUTERJUNG,

Manufacturers of
PEN AND POCKET CUTLERY,
Solid Steel Scissors, Shears, Razors, &c.
Sole proprietors of the renowned full concave patent
"ELECTRIC RAZORS,"
And the celebrated "ELECTRIC SHEARS." Nickel Plated
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Agents for the BENGAL RAZORS.
AMERICAN TABLE CUTLERY, BUTCHER KNIVES, &c.
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THE "PATENT IVORY" HANDLE TABLE KNIFE.

The oldest manufacturers of Table Cutlery in America. Exclusive makers of the CELLULOSE HANDLE
for Table Cutlery. A most beautiful and perfect substitute for Ivory. Also makers of all kinds of TABLE,
BUTCHER AND HUNTING KNIVES. Illustrated catalogues with prices sent to the trade on application.
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88 CHAMBERS ST. N.Y.
MFG. CO.
AMERICAN TABLE
CUTLERY & C.

AARON BURKINSHAW,
Manufacturer of Pen and Pocket Cutlery, Pepperell, Mass.
My Blades are forged by hand from the best Cast Steel, and warrant-
ed. To me was awarded the Gold Medal of the Conn. State Agricultural Society.
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Manufacturers of FINE PEN & POCKET CUTLERY.
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MANUFACTURERS OF
Improved
Carpenters'
Tools.
No. 113, Improved Adjustable Circular Plane \$4.00

PAYSON & CO.,
MANUFACTURERS OF
BUILDERS' HARDWARE.

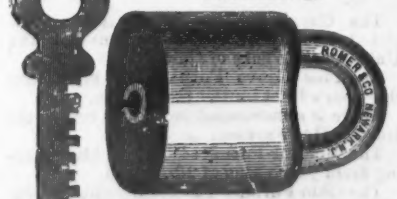
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Door Jamb Bolts,
Flue Joist Shoes,
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Romer & Co.
Established 1837.



Manufacturers of Patent Scandinavian or Jail
Locks, Brass Pad Locks for Railroads and Switches.
Also Patent Stationary R. R. Car Door Locks. Pat-
ent Piano and Sewing Machine Locks.
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Shovels, Spades and Scoops. Their Trowels and Hoes
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and cheapness. While all their goods compare advan-
tageously with those of other makers and are largely
exported.

**MACHINE MOULDED
MILL GEARING.**

AS ACCURATE AS CUT GEARING
AND MORE DURABLE IN USE.
Saves Time and Expensive Patterns,
SHAFTING, PULLEYS AND HANGERS,
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LEFFEL TURBINE WATER WHEELS,
STEAM ENGINES AND BOILERS,
MIXERS FOR FERTILIZERS AND CHEMICALS.
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John Carver,
MANUFACTURER OF
CAULKING IRONS,
Cotton, Freight and Hay Hooks,
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Cutlery.
HAVE YOUR HAIR CUT.



Clark's Hair Clipper.

Extensively used and the only reliable machine
for close clipping.
Simple in operation and finishes the work in
short time.

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Silver Medal, 1878-Paris.



J. R. SPENCER & SON,
Albion Steel Works, Sheffield,

MANUFACTURERS OF
FILES
AND
STEEL,
Table Knives, Razors, Shovels, &c., &c.,
of every description.

CORPORATE MARK.

SPENCER
SHEFFIELD

Granted 1749.

Cutlery.

JOSEPH S. FISHER,

No. 411 Commerce St., PHILADELPHIA

AGENT FOR
George Wostenholm & Son,
"Limited."

Washington Works, SHEFFIELD,
Celebrated I-XL Cutlery, Razors, &c

AGENT FOR
WALTER SPENCER & CO.,

Steel and File Manufacturers,
Rotherham, ENGLAND.

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Granted 1777.

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13 Warren St., N. Y.,

Importer of CHAINS, ANVILS, VISES, &c.

AGENCY OF
HILL BROTHERS & CO., WALSALL, ENGLAND

GENERAL HARDWARE MERCHANTS,
And of

BALL'S PAT. SOLID STEEL SHEEP SHEARS.

These shears are unsurpassed for cheapness, dura-
bility and utility. They are made of one solid piece
of steel from point to point, and cannot be broken in
use either in the bow or at the junction of the shank
and blade. Samples can be seen at above address, or
sample lots furnished.

CORPORATE MARK,
* * *

Joseph Rodgers & Sons'
(LIMITED)

CELEBRATED CUTLERY,

No. 32 Chambers Street, New York.

F. & W. CLATWORTHY, Agents.

The demand for Joseph Rodgers & Sons'

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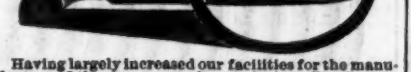
Manufacturing Premises and Steam power.

To distinguish Articles of Joseph Rodgers

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Young's Patent Folding Scissors.



Having largely increased our facilities for the manu-
facture of these very popular goods, we offer them to
the trade at a large reduction from our former
prices. The list price of the large size is now \$12.00
per dozen, formerly \$16.00, and the small size, \$8.00,
formerly \$12.00. The material used in the manufac-
ture of Young's Patent Folding Scissors is the
very best. All are nickel-plated and furnished with
a neat morocco case.

MARX BROS., Proprietors,

430 Broadway, New York.

PHENIX CASTER COMPANY, Indianapolis, Ind.



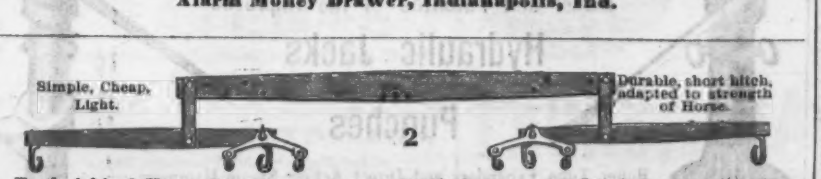
Our different sizes of Casters are adapted for use as designated below.

No. 2. For parlor chairs and other very light furniture.
No. 3. For invalid and office chairs, extension and other light tables, rope reels, flower stands, &c.
No. 4. For bedsteads, &c., &c.
No. 5. For heavy bedsteads, book cases, flower stands, refrigerators, safes, sideboards, desks or very
heavy furniture.
No. 6. For pianos, extra heavy sideboards and bookcases.
No. 7. For show cases, light store trucks, ice chests, heavy refrigerators, heavy flower stands, &c. Es-
pecially useful as a truck under sample stoves or any heavy sample goods.
No. 10. For heavy ice chests, magazine boxes, store trucks, heavy show cases, beer boxes, large refrig-
erators, or any very heavy weight. Especially adapted for use in beer bottling, fruit canning, tobacco or ware-
house establishments, where heavily-loaded tables need to be moved.
No. 14. Warehouse trucks, or for carrying any immense load.
Send for illustrated catalogue.

GRAHAM & HAINES, 113 Chambers Street, New York, General Agents.



TUCKER & DORSEY,
Manufacturers of Tucker's Incomparable Adjustable Stove Trucks and Tucker's
Alarm Money Drawer, Indianapolis, Ind.



Frederick's 3-Horse Equalizer is a perfect Double Tree, a perfect Tripple Tree, a perfect 3-Horse
Stretcher, a perfect 3-Horse Stretcher, a perfect attachment for either 2 or 3 horses anywhere.
M. E. BUNGER & CO., Indianapolis, Ind., Manufacturers.

Established in 1839.

A. G. COES & CO.

WORCESTER,

MASS.,

Successors to

L. & A. G. Coes,

Manufacturers of

THE GENUINE

COES

Screw

Wrenches.

PATENTED,

May 2, 1871.

December 26, 1871.

December 28, 1875

August 1, 1876.

The back strain when the wrench is used is borne
by the bar—not by the handle.
The strongest Wrench made, and the only suc-
cessful Re-enforced Bar.
None genuine unless stamped

A. G. COES & CO.,

Our Agents, GRAHAM & HAINES, 113 Chambers St.,
New York, carry a full line of our goods, and will be
pleased to serve you at factory prices.

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ESTABLISHED 1836.

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COMMISSION MERCHANTS,

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Guns and Pocket Cutlery,

SPECIALTIES.

Headquarters for

ELEY'S BROS. GOODS, WRIGHT'S ANVILS,
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WOSTENHOLM'S POCKET CUTLERY AND RAZORS.
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STUBS' FILES, WESTERN FILES,
GILBERT'S SHEEP SHEARS,
CHESTERMAN'S TAPES,
GERMAN COIL AND HALTERS and other CHAINS.
BRADY'S TROWELS AND HOES.
CANASTOTA KNIFE CO.'S POCKET KNIVES.
Etc., Etc., Etc.

All sorts of Hardware and Merchandise for im-
port and export purchased on commission.

The "Monroe" Patent Combined

GLOSSING AND FLUTING IRON.

With Brass or Nickel Flutes. Prices furnished
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Manufacturers of

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Chandlery Hardware.

No. 290 Pearl Street, New York.

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59 Fulton St., New York.

Agency for Barnes' Foot-Power Machinery.

Velocipedes, Roll Saws, No. 1, \$12.00; No. 2, \$15.00;
No. 3, \$18.00; No. 4, \$22.00; for fine fret work. Veloc-
ipedes, Roll Saws, with seat, No. 1, \$25.00; and "Large"
Saw, \$30.00; both for light and heavy carpenter use.
Machining and Molding Machines, each, \$5.00. Com-
bined Circular and Scroll Saws, \$40.00; with boring
attachment, \$50.00; Hand Circular Saw, \$20.00; for
heavy work. Lathe, \$35.00; \$50.00; \$100.00. Fifty-four
page catalogue, description of above, given on appli-
cation. One hundred page catalogue now in print.

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MANUFACTURERS OF

Cutlery and Silver Plated Table Ware.

TRADE MARKS:

Established 1871.

Established 1865.

On Spoons, &c. 1871 ROGERS & S. 5 oz.

WM. ROGERS & SON, AA.

On Knives.....

HARTFORD CONN. 12

Our Knives are guaranteed
TO STRIP
12 dwts. of Silver per Dozen.
All our goods are put up
ONE DOZEN IN A BOX.

Our SPOONS, FORKS, &c., are guaranteed
TO STRIP
On Tea Spoons..... 48 dwts. per gross
On Dessert Spoons and Forks.... 72 dwts. per gross
On Table Spoons and Med. Forks. 96 dwts. per gross
ALL OTHER GOODS IN PROPORTION.

All our SPOONS, FORKS, &c., are
guaranteed to be plated upon
18 per cent. Nickel Silver,
the best known base for plating
upon.

OUR GOODS ARE PLATED 20 PER CENT. ABOVE STANDARD PLATE.

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WM. H. WATROUS, President.
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507 Commerce Street, Philadelphia.

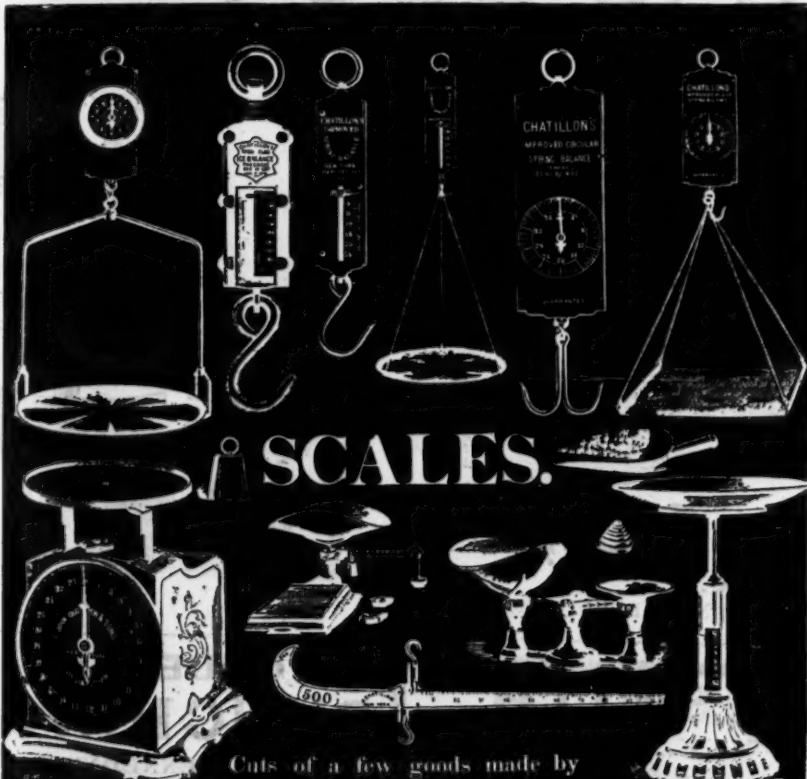
E. & G. BROOKE'S "Anchor Brand" Nails, Brads,
Spikes, &c.
MALLORY, WHEELER & CO.'S Door and Pad
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UNION MANUFACTURING CO.'S Butts.
AMERICAN SCREW CO.'S Screws.
D. B. BARTON TOOL CO.'S Edge Tools, &c.
FRANCE'S Shutter Holders.
Anti-Window Rattlers, Brass and Nickel-Plated.
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AMERICAN SHEAR CO.'S Shears and Scissors.
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Scoops.

BROWN & BROS.' Brass and Copper Wire,
Rivets, Spoons, &c.
GAYLORD MANUFACTURING CO.'S Tilt, Chest
and Cupboard Locks.

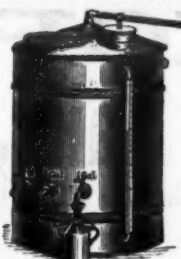
AMES' Genuine  Chester Emery.

PHILADELPHIA Carriage and Tire Bolts.
PLYMOUTH MILL CO.'S Black and Tinned Iron
Rivets.
AMERICAN MACHINE CO.'S Fluters, &c.
STUART, PETERSON & CO.'S Tinned and Enam-
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HUSSEY, HOWE & CO.'S Bar & Sheet Cast Steel.

Also a large line of Heavy and Shelf Hardware.



JOHN CHATILLON & SONS, NEW YORK, U.S.A.

Self-Measuring Oil Tank!
Patented Oct. 23d, 1877.Economy, Convenience and Cleanliness
Combined.All five-barrel tanks have five-gallon
measure, without extra charge.
Send for circular.Kellogg & Johnson,
Sole Manufacturers,
ELMIRA, N. Y.

AGENTS.

JENNINGS & BENTLEY, 59 Jefferson Avenue, Detroit.
A. M. GILBERT & CO., 95 Lake Street, Chicago.
" " 157 Water Street, Cleveland.
" " 116 Main Street, Cincinnati.
STAR OIL COMPANY, 215 Michigan Street, Buffalo.
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THE STAR SALT CASTER CO.,
Office, No. 161 FRANKLIN ST., BOSTON,
Manufacturers of

Specialties in House Furnishing Hardware.

PATENT EXTENSION DOOR KNOBS

(Pat. Jan. 29, 1878)
manufactured in
every variety of
style. Silver-Glass,
Silver-Center, Fine
Cut, &c. Fitted with
heavy silver-plated
mountings. Extend
from 1 to 3 inches.
They can be adjust-
ed to doors of any
thickness without the
annoyance of the
old-fashioned
washers and pins.
Our "Patent Cham-
ber" (Pat. Nov. 6,
1877) prevents all
possibility of the
bursting of the glass
bulbs.
A trial will make
plain their merits.
Send for illustrated
price lists and circulars.

THE STAR SALT CASTER CO., Boston, Mass.

ALWAYS ASK FOR
ESTERBROOK'S
Steel Pens.

THE MOST POPULAR PENS IN USE.
For Sale by all Stationers.
ESTERBROOK STEEL PEN CO.,
Works, Camden, N. J. New York.

PHOSPHOR-BRONZE.
Bearings,
Pump Rods
and
Spring Wire.
Apply to
The Phosphor-Bronze Smelting Co., Limited,
303 Washington Avenue, Philadelphia.

the best buyers. These sales are regarded as
excellent transactions.—*Fronton Register*.
The Gaylord Rolling Mill, at Portsmouth,
suspended for six months, was to resume
work under the new organization known as
the Portsmouth Iron and Steel Company, on
Monday the 26, under the management of
Mr. J. C. Lewis. It will be the 47th year of
its operation.

NEW JERSEY.

The Ferracute Machine Works, Bridge-
ton, have recently received several large
orders for their goods for shipment to
parties in Europe and the British Colonies.
They make a specialty of foot and power
presses and dies for cut and drawn work in
sheet metal, seamers and other tools for can
makers, &c. They are getting up a new
catalogue, which they expect to be ready
in the course of a few weeks.

Cox & Son, of Bridgeton, have recently
moved into new and larger premises. They
have just brought out a small power steam
engine, which will be placed on the market
at an early date.

MICHIGAN.

The following, from the *Marquette Mining
Journal*, is a statement of Lake Superior
iron ore shipments from the port of Escan-
aba, for the season of 1879, up to and in-
cluding May 14:

Mine	Gross tons.
Jackson.....	3,545
S. Jackson.....	1,773
New York.....	3,332
Cleveland.....	596
Angelle, Hard.....	1,611
Barnum.....	2,903
Saginaw.....	127
Salisbury.....	1,975
Michigan.....	2,568
Superior, Hard.....	949
Superior Hem.....	280
McComber.....	1,026
Mitchell.....	874
Smith.....	629
Vulcan.....	1,789
Quinnesec.....	3,197
Cleveland Hem.....	1,347
Cyclops.....	1,598
Emmett.....	1,115
Norway.....	3,950
Edwards.....	303
National.....	2,048
Total.....	37,634

MARQUETTE.	Gross tons.
Cleveland.....	2,200
Lake Superior.....	1,477
Champion.....	2,314
Edwards.....	240
Carp River, quartz.....	92
Total.....	6,323

The rates established by the "association
board of directors," whatever, or whoever,
that they may be, in the carrying trade
this season is: Ore from Escanaba to Cleve-
land, 90 cents per gross ton; from Mar-
quette and L'Anse to the same port, \$1.25.
The rates on coal have been fixed at 45 cents
to Marquette, and 55 cents to Portage Lake.

KENTUCKY.

C. W. Russell is preparing to make a blast
at the Estill Furnace.

ALABAMA.

Giles Edwards, who has had a furnace
under way for some years at Woodstock,
has begun operations with a view to finish-
ing the works at an early date. The stack
is 12 x 48, and is designed to burn coke and
use the Alabama ores.

T. T. Hellman and H. D. De Bordilaben
have made arrangements to begin at once
the construction of a blast furnace at Bir-
mingham. It will be 14 x 55 feet, and will
be operated with coke and Central Alabama
ores. The firm is financially strong, and
will push the work to completion as rapidly
as first-class construction will permit.

Eureka Furnace is making 45 tons of good
foundry iron daily, and finding ready sale
for the product.

TENNESSEE.

The furnace at South Pittsburg has been
started. Miss Bowron, sister of the general
manager, touched fire to the furnace. Mrs.
Bowron, wife of the manager, opened the
throttle and turned the steam on the blast
engine that blew the first blast into the fur-
nace. This company have orders on hand
now for 500 tons of pig iron; they also re-
ceived an order a few weeks ago from a
man in Louisiana for eleven different sizes
of kettles and 30,000 pounds of each kind.
The South Pittsburg *Independent* says that
everything worked to perfection. Slag was
run about 5 o'clock Monday morning, the
furnace having been lighted Saturday and
the blast put on Sunday, making just 24
hours from the time of lighting until blast
was put on, and 24 hours from that until
the first metal was run. Everything is now
working well and the furnace will soon be to
its full capacity.

The Crawshaw Family and the Cyfarthfa
Iron Works.

One of the great iron kings of England,
Robert Crawshaw, the owner of the great
Cyfarthfa Iron Works in Wales, died on the
10th inst. in Cheltenham, and, as the his-
tory of the works and the Crawshaw family
is full of interest, we present the following
details published by the *Times*:

A hundred years ago the son of a Yorkshire
yeoman grew dissatisfied with home and
wanted to see the world. He went to London
with a slender stock of money, soon expend-
ed, and found employment at an ironmongery
store kept by a successful trader named
Bicklewith, who made him sign a bond to stay
with him three years. Before that time had
elapsed the Yorkshire lad had proved him-
self an invaluable assistant. Eventually
his master gave him a partnership and at
his death the boy succeeded to the busi-
ness. Years passed on, and Bicklewith's
successor grew rich by trade and became
known as a capitalist. His name was
Richard Crawshaw. Now, just at the time
when this young fellow had arrived in Lon-
don, one Anthony Bacon had concluded a
lease for 99 years of a tract of coal and iron
land, about 8 miles long by 4 miles broad, at
Cyfarthfa, in the Vale of Merthyr Tydvil.
England was on the eve of the American
war of independence. Mr. Bacon having
built furnaces and forges for the manufac-
ture of bar iron, obtained from the govern-
ment a contract for making cannon. A
Mr. Homfray, who had a prior interest in
the mineral district, joined Bacon, and they
did a good business and made sufficient
money to quarrel over and decide to sell all
or most of their property. A new capitalist

was found. The name and fame of Richard
Crawshaw had reached Cyfarthfa and Mer-
thyr before he had finished negotiating.
When the bargain was struck, the local
people seemed to raise their heads as if by
instinct and say, "South Wales is made."
It was predicted that the new man was the
right man for the work.

In 1774 Mr. Homfray established the
Pen-y-danen Works, and shortly afterward
projected a canal to Cardiff, a famous South
Wales seaport; but just at the moment of
action he gave it up and retired to private
life. By this time the blast furnaces of
South Wales were lighting up the dark val-
leys at night and occupying busy crowds of
men by day. The genius of the iron trade
was stirring in all directions. Bacon having
died, Homfray retired. Mr. Richard Craw-
shaw was now sole and only proprietor of
the Cyfarthfa Works. He picked up the
fallen canal scheme and carried it through.
Busying himself in the promotion of the
local trade, and sending his iron bars beyond
the seas, he also watched over the social
welfare of the growing community which he
ruled. He was a frank, robust man, this
Richard Crawshaw, strong willed, but lib-
eral, as was shown by his treatment of a
stranger who one day arrived penniless and
footed at Merthyr. The stranger was a
nice-looking, respectable youth, but tired
with walking on highways, and he had
spent what little money he had in bread at
wayside stores. On reaching Merthyr he
inquired for the house of Mr. Crawshaw.
Asked where he came from, he said, "I'm
from Yorkshire, and I've walked here to see
my uncle." The same spirit which had
moved that other boy who left Nuneaton on
his pony, had actuated another adventurous
Yorkshire lad. Conducted to Mr. Craw-
shaw's house, the boy was well received and
given employment at the works, and when
Richard Crawshaw died he bequeathed to his
nephew two-eighths of the Cyfarthfa Works.
This second boy, seeking his fortune, found
it. He was Richard Bailey, and he was
knighted by the Queen, dying Sir Joseph
Bailey, famous and respected, and leaving
behind him a fortune of £20,000,000.

While Richard Crawshaw was pushing his
works along, he heard that a certain Henry
Cort was working a new process of puddling
iron at some small foundry, near Gosport.
Crawshaw went there, approved of the
method, returned to Cyfarthfa, and built
works both for puddling and rolling on
Cort's plan, paying the patentee 10/ for
every ton of iron turned out under his pro-
cess. Among other improvements and ex-
tensions of the works, Richard Crawshaw
erected a water wheel 50 feet in diameter,
80½ feet in breadth. The magazines and
scientific papers of the time described the
wheel as one of the modern wonders of the
world. It was made by a local engineer
named Watkin George. The remains of this
giant of the past may still be seen on the
Taff. Crawshaw gave this Watkin George
a share in the works, to extend over a
period. When George went out, some
dozen years afterward, in addition to salary,
he received his share of \$500,000 profit.
Mr. Crawshaw took in other partners at
various times, and at his death the disposi-
tion of the Cyfarthfa Works was three-
eighths to Benjamin Hall, two-eighths to
Joseph Bailey. Richard Crawshaw died
worth £1,500,000, a fortune far short of
that made by his nephew, who, besides his
Cyfarthfa interests, had vast iron properties
in Monmouthshire. When Richard Craw-
shaw died, Hall and Bailey retired, and the
works came into the possession of William
Crawshaw, who, with Sir Joseph Bailey, had
practically managed them for several years.

Under this new iron king, who had a
genius for invention, Cyfarthfa advanced
with gigantic strides. In 1810 it numbered
six blast furnaces, and in that year produced
11,000 tons of pig iron and 612,000 tons of
bars. In 1821 it turned out more of these
manufactures than the three kingdoms put
together had done between the years 1740
and 1750, and fully half the yield of all
Great Britain so late as 1788. From 1817 to
1840 the Glamorganshire Canal, which the
first Crawshaw had started, carried from
Cyfarthfa 613,144 tons of puddled iron.
The most important of the rolling mills was
erected in 1846, designed by William Wil-
liams. Attached were 18 boiling furnaces
and 20 puddling furnaces, which in March,
1847, turned out 6144 tons of rails, and in
the same month the largest bar of iron pos-
sibly ever made. It measured 27 feet long
and 6½ in diameter, and weighed 2941 tons.
In his old age William Crawshaw retired
to his seat at Caversham Park, near Read-
ing, on the Thames, having, however, built
Cyfarthfa Castle, a magnificent residence,
near the works. He left a son, Robert, in
charge, and dying in 1867 bequeathed him
all his property, which, besides other val-
uables in lands and gold, included Cyfarthfa
with its 11 furnaces—7 at Cyfarthfa proper
and 4 at Ynysfach—7 ironstone pits and 8
coal pits. The estimated fortune of William
Crawshaw was £35,000,000.

Merthyr Tydvil, where the works are
located, has grown from a village to a town.
In 1831 the population had risen to 22,083;
in 1841 to 34,977; in 1851 to 46,378; and
in 1871 to 96,891, which, however, takes in
the parts of Aberdare and the hamlet of
Caed-y-Cymmer. It returns two members
to Parliament. In 1873, when the "com-
pany" mania was waning, an enterprising
"promoter" entered into preliminary ar-
rangements to buy the Cyfarthfa Works,
and launch the scheme under the joint
stock act. A syndicate was said to have
been formed for the purchase, and along
with it a bituminous colliery of 1000 acres
in the same locality. Mr. Robert Crawshaw
was quite willing to sell, since he could no
longer work in harmony with modern ideas
of the rights of labor, and a sum was fixed
at which the works could be bought. The
scheme, however, fell through, owing to
the failure of another gigantic effort of the
same financier.

Lovegrove & Co., Philadelphia, have re-
ceived orders from Russia for several steam
engines—one this week from a firm in Riga.

Governor Robinson, on the 26th instant,
signed the bill for the relief of the New York
Tunnel Co.

"OLDEST" AND "LARGEST"
And only "Incorporated"
TILL COMPANY
In the World.
FAIRBANKS SCALE COMPANY,
WHOLESALE AGENTS.
Send for Price List and Circular.

Wilson Bohannon,
Manufacturer of Patent
BRASS PAD LOCKS
For Railroad Switches, Freight Cars, and the Hard-
ware Trade. All sizes, with Brass and Steel Keys,
with and without chains.
Patent Horizontal Rim Cylinder Night Latch.
Self-adjusting to doors of any thickness, with Patent Stop and Drawer Back Knob
RIGHT OR LEFT HAND.
PASSENGER CAR LOCKS, Bronzed, Nickel-Plated and Japanned
Catalogues and Samples sent upon application. **BROOKLYN, N. Y.**

H. D. SMITH & CO.,

Plantville, Conn.,

Manufacturers of the

BEST QUALITY CARRIAGE MAKERS' HARDWARE.

Manufacture the Largest Variety of Forged Carriage Irons of Best Material and Workmanship.

PRICES LOW FOR QUALITY OF WORK FURNISHED.

SEND FOR PRICE LIST.

SARANAC HORSE NAIL CO.

Polished or Blued Horse Nails, Hammered and Finished.

The Saranac Nails are hammered hot and the finishing and pointing are done cold. Quality is fully guaranteed. For sale by all leading iron and hardware houses.

S. P. BOWEN, President and Treasurer.

J. W. LYNDE, Secretary.

All correspondence should be addressed to the Company or to the President and Treasurer.

PLATTSBURG, N. Y.

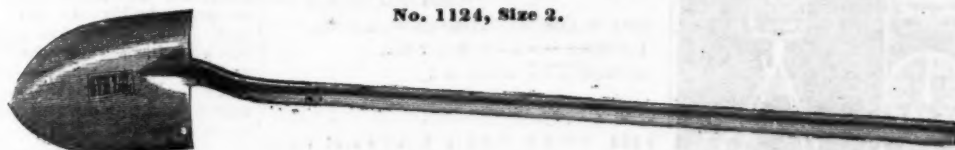
SHOVELS, SPADES & SCOOPS.

Patented.

MADE FROM

BEST CAST STEEL.

No. 1124, Size 2.



No. 6121, Size 2.

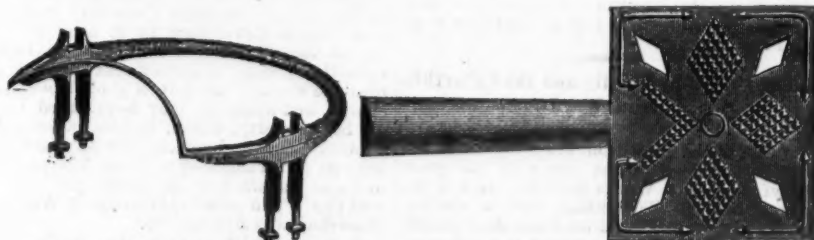


HUSSEY, BINNS & CO.,

PITTSBURGH, PA., U. S. A.

Catalogue and prices given upon application.

Sold by Pugsley & Chapman, No. 8 Liberty St., New York.



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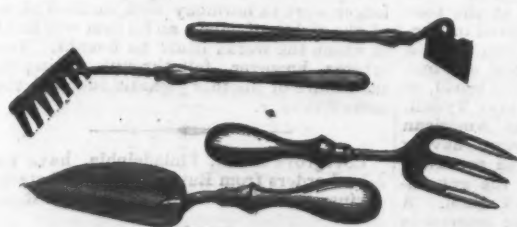
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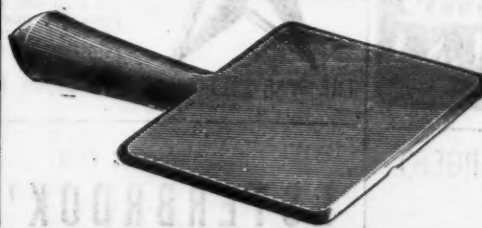
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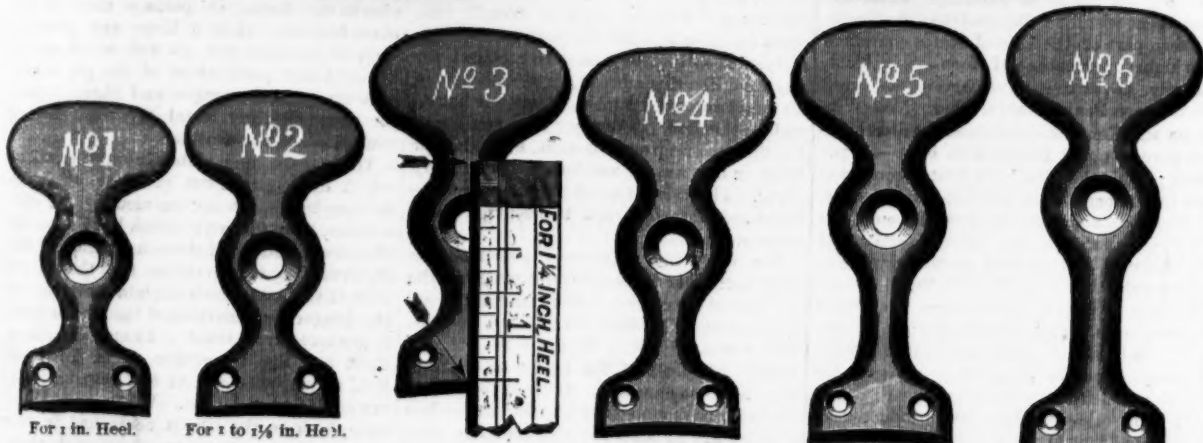
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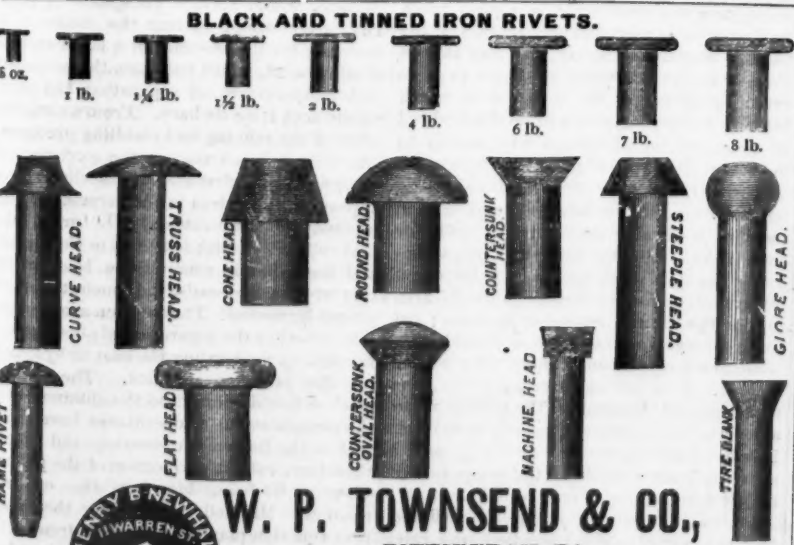
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Steam Towing on the Erie Canal. The Cable System.

Short newspaper items within the last few weeks have stated that cables were being made for steam towing upon the Erie Canal but very few readers, perhaps, understood either the system or its importance. What is known as the "Belgian" system of cable towing is to be tried upon the Erie Canal. It will add vastly to the transporting capacity of the canal, not only by increasing the speed of the boats, but by diminishing the cost of towing. Abroad the system is a thorough success, and the experiments that have been made in this country show that the conditions which prevail here are even more favorable than in other countries. To carry the work forward, a complete organization has been formed by gentlemen in New York, in control of adequate capital, and contracts for the manufacture of wire cable, also for the construction of a very respectable fleet of tow-boats, are already in course of execution. The organization is the "New York Steam Cable Towing Company," who have fitted up commodious offices in Broadway, and who, under their charter from the State of New York, are now at work in earnest. Mr. J. Lloyd Haigh, the well-known manufacturer, who, it will be remembered, made the wire for the Brooklyn Bridge, has taken the contract for about 300 miles of cast steel wire rope, and Messrs. Anderson & Co., of Pittsburgh, Pa., have a sub-contract from Mr. Haigh for about 1600 tons of cast steel wire rope. In this case Mr. Haigh, after drawing the wire at his works, makes the rope itself, by special machinery, in a sort of floating workshop at the point where it is to be laid down. This will obviate the necessity for making the rope up into unwieldy coils, and also do away with special boats and machinery for laying—the rope being paid out as fast as made—and no splicers will be required. The rope will be seven-eighths of an inch in diameter, and the process of laying it down will begin next month. We learn from Mr. Haigh that the method is in several respects peculiar. It is usual to make the strands and twist them. The advantage gained in the present instance is that the machine not only twists the wire into strands, but also twists the strands into rope, which is a new feature not before introduced.

In regard to the cable steamers, we learn that a contract has been made with the Troy Power Company for the construction of a fleet of 13, the cost of which will be about \$10,000 each—\$130,000 altogether. These boats will be 75 to 80 feet in length, with 14 feet beam and 6 feet draft, and the engines will have 12 inches stroke, with 12-inch cylinders. The power exerted by a single steamer will probably be equal to about 25 horses, sufficient for the propulsion of eight boats at a speed much more rapid than the movement of boats by horse power under the most favorable circumstances.

The Belgian system of towing has been used on the canals and rivers of Europe for many years, and with advantages, in a commercial point of view, which have been amply demonstrated. In this country a line of 42 miles, from Buffalo to Middleport, was operated in 1876 with complete success, but the way has not seemed open until the present time to apply the system on an enlarged scale. The speed, as we are told, "was three times greater than the average of the animal power, although seven times the amount of freight was hauled by the cable boat," and "the mechanical results were entirely satisfactory." The longest tow of the season was seven canal boats loaded with 1499 tons of coal, the equivalent of 150 carloads. The canal boatmen, it is said, were particularly pleased with the substitution of steam power for the animal motor.

Briefly described, the system consists of a wire rope laid in the prism and fastened at the two extremes of the canal, and a tow-boat or tug is provided with an engine, to which is attached the clip drum or grooved driving wheel, working in connection with suitable guiding and tightening pulleys. In operating the system, the boats to be towed are shackled together end to end, and the train thus arranged is attached to the tug in such a manner as not in the least to interfere with the free action of its rudder. The cable is lifted from the bottom of the canal and placed over the driving wheel, and held in position by the guiding and tightening pulleys. The engine being started, the driving wheel is turned, causing the cable to pass over it without slipping, and fall back again into the canal at the stern of the tug. Thus the tug with the train attached is drawn along the cable with the same facility that a locomotive draws its train on the rails.

There is reason to believe that the Cable Towing Company are well fortified in funds, and will advance promptly to a successful termination. The advantages to the State and to the country at large cannot well be exaggerated, judging from present indications.

Legal Decision.—Cornice Machinery.—The Honorable Samuel Blatchford, United States Circuit Judge for the Second Circuit, has recently rendered an opinion in the case of Valentine Fischer against Henry Wilson and others, brought in New York city, in which the patent of Mr. Fischer, dated the 4th day of February, 1868, No. 74,068, for a machine for making sheet-metal cornices, was declared good and valid, and an injunction and accounting obtained against the defendants. The particular claims of this patent which were involved in this case, were the second claim, for a concave standard or support for the lower die, so arranged that the metal already partly formed could bend down and under this lower die, while other curves or angles were being formed in it to complete the design of the cornice, and also the fourth claim, which is for placing the female die over the male die for the purpose of keeping the male die clear of dirt, scale and other foreign matter, so that the work shall be smooth. The case was pending for a long time, and the defendants introduced in defense many prior patents and publications and examined many witnesses, but Judge Blatchford held that none of their defenses anticipated the patent.

MINING AND MINERAL ITEMS.

COAL.

The Reading Coal and Iron Company has purchased the colliery of the Thomas Coal Company at Shenandoah. There are two breakers at this colliery, and the annual production is about 150,000 tons.

At the Coalton Coal Mines, Kentucky, work continues as vigorously as before. There are now 225 miners at work, and 57 drivers and other outside laborers. In last month over a third of a million bushels of their famous Coalton coal were dug, as follows:

Lump coal, bushels.....	243,343
Nut " " " " " " " " " "	48,668
Slack " " " " " " " " " "	60,896

The situation at the railroad mines near Pittsburgh remains about as reported last week. The majority of the mines along the Panhandle remain idle. At Sandy Creek, Plum Creek and the old Armstrong Mine on the Allegheny Valley road, the men are averaging about half time. At the Hampton and Duquesne, on the Central road, about the same. At the Turtle Creek No. 4 they are doing rather better.

Unless there should come a rise in the rivers soon, work at the mines along the Monongahela and Yough rivers will likely be suspended, as the empty crafts are nearly all loaded. It is estimated that from ten to fifteen million bushels of coal now await a coal-boat rise. Below Pittsburgh acres of loaded coal barges and boats can be seen, with their tow-boats alongside ready to start for the lower markets. Should there come a good stage of water there will probably depart the largest coal fleet that ever passed down the Ohio River. Already many of the miners from the river are looking for employment elsewhere. It is said that some of the mines have already suspended, and others will do so this week for want of loading.

The fire in the lining of the shaft at the Stanton Mine has been extinguished. There are said to be 150 feet of water in the mine. This is more than was at first thought to be necessary. It is believed that the burning coal has been reached, but it is impossible for the miners to get down to it, and the exact condition of affairs can only be conjectured.

IRON.

We condense the following from the Marquette Mining Journal: The new discovery at the old Himrod mine begins to look as if it might develop into one of the very best mines in the so-called Negaunee hematite range. At the Manganese mine 2000 tons of ore are in stock and ready for shipment as soon as the branch track is completed. The ore carries a large percentage of manganese, and will sell for a considerable advance over the ruling price of the best hematite. The mine looks well, and it is estimated can be made to yield a product of not less than 10,000 tons before the close of navigation. At the Champion mine there are eight of the Rand drills in constant use; at the Superior, there are three or four, and the Republic has determined to purchase no other hereafter.

It is stated that a contract has been made for carrying 40,000 tons of ore from Escanaba to Chicago at 67½ cents per ton, the lowest rate ever yet obtained.

It is reported that the top and sides of Selwood's pit at the Cleveland Iron Mining Company's works, near Negaunee, Mich., have fallen in, precipitating 60,000 tons of rock into the bottom of the mines, destroying the tramway and hoisting apparatus. A large quantity of iron ore prepared for shipment, and which was lying at the bottom of the mines ready to be hoisted and shipped when lake navigation opened, has been covered with the rock and debris.

The discovery of a seemingly large deposit of first-class red specular ore is reported, on land belonging to the Iron Cliff Company, Lake Superior in the neighborhood of the abandoned Excelsior Mine, west of Ishpeming.

Neely & Sweeney have secured a fifteen-year lease of the Grand Central Mine, Lake Superior, and have a force of men at work taking out ore.

COPPER.

The Calumet and Hecla Company pay their regular quarterly dividend of \$400,000 to the 80,000 shareholders on the 15th, which makes a grand aggregate of \$15,050,000 paid within the last 10 years. It may justly be claimed as the best paying mine on the American Continent.

The Tunnel of the Baltimore Water Works.—The great tunnel for the permanent water works, 6½ miles in length, is progressing rapidly toward completion. There remains but 1600 feet to be finished out of the entire length. The tunnel commences at the Great Gunpowder River and runs perfectly straight, with an inside diameter of 12 feet, to Lake Montebello, the receiving reservoir. There are 15 shafts along the line, from 2000 to 3000 feet apart and from 50 to 300 feet deep. One of the most difficult and successful engineering feats that has been performed since the commencement of the tunnel was accomplished a few days ago by Mr. C. O. Swann, the Resident Engineer. It was the union of two headings between shafts 3 and 4, the most of which was done by Thos. McCabe, contractor. Shaft No. 3 was 276 feet deep, and shaft No. 4300 feet, being the two deepest on the whole tunnel. The distance apart was 2100 feet. The center line was so exact that it struck a plum line. In the level there was no apparent difference whatever, and measurement varied only one inch between the surface and the tunnel measurement. The entire work will be completed in about 12 months.

A letter was received in Pittsburgh last week from an extensive locomotive establishment in Glasgow, Scotland, inquiring at what prices American planished sheet iron could be delivered in quantities abroad. The manufacturers referred to had seen it in the shape of jackets on Westinghouse air pumps, and were so much pleased with its appearance that they are desirous of using it as jackets for their locomotives, instead of rough iron painted. We learn from Messrs. W. D. Wood & Co. that such inquiries are by no means rare, and that they are constantly shipping it in small quantities to all parts of the world. They have recently shipped a very fair order to Rio Janeiro.

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AND
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The announcement that a steel shaft for a
steamboat, now building at Pittsburgh, has
been ordered from Krupp, will doubtless turn
the attention of our steel manufacturers to
the demand for this class of work, and lead
to the development of this industry in this
country. Not one of the many steel estab-
lishments at Pittsburgh, nor in the country,
we believe, has the necessary plant for cast-
ing and shaping such large pieces of material
as this shaft. It is possible that, if the rough
casting could have been obtained, some of
our machine shops or forges could have
worked it out; but this was not possible.
That a large demand for steel shafts and
other large steel forgings could be created
in the West, there is no doubt. There are
between 700 and 800 steamboats in the
Western waters. These are mostly power-
ful boats, built for towing on the peculiar
system practiced in those waters, which
requires that the boat shall be exceed-
ingly strong in all its parts. There is no

doubt that a works arranged to turn out such
forgings would have plenty of business at
a good profit. The substitution of steel for
iron, and the great improvements that have
been, and will be, made in the character of
steel, and the facilities offered by the open-
hearth plant for producing large masses, will
lead to the development of this industry in
the near future. It may be said that the
shaft mentioned is to be of open-hearth
steel, 36 feet 7½ inches long and 15 inches
in diameter in the center, tapering to 13
inches, and will weigh in the neighborhood
of 20,000 pounds. The price is 9 cents a
pound in New York.

The Protection Movement in Great Britain.

The text of the speech delivered in the
House of Lords on the 29th of April by
Lord Beaconsfield, is even more remarkable
than the telegraphic abstract warranted us
in believing. Beaconsfield is a shrewd ob-
server of the drift of popular opinion, and
is politician enough to seek at all times to so
shape his course as to have a strong con-
stituency behind him. When, therefore, he
says in plain words that British opinion con-
cerning free trade and protection is under-
going a change, and that British laws must
inevitably follow the change, his words
have a peculiar significance which would
not attach to those of any one less ambitious
to be a popular leader, and less successful
in deciding what are the popular issues. He
is of the opinion that any change in the
tariff policy of Great Britain should be
made slowly; but that he should regard such
a change as inevitable, will probably surprise
many who have not regarded the movement
in favor of protection of British industries
as expressing the views of a minority large
enough to claim recognition as a factor in
national politics. Lord Beaconsfield evi-
dently thinks differently. In the speech
above mentioned, he declared that the two
most prosperous nations of the world at the
present time are the United States and
France, both protecting their industries,
while the countries adhering to free trade
are, without exception, suffering extreme
industrial and commercial depression. To
the persistent assertions of those who believe
that free trade is the sole condition of na-
tional prosperity, Lord Beaconsfield says:
"I think it cannot be denied that a state of
great national prosperity is quite consistent
and compatible with this country being in
favor of protection of native industry. That
is a position that years ago was denied; but
I think that the experience we have around
us, with the experience we have of France
and the United States of America, the two
most flourishing countries now existing, it
cannot for a moment be maintained that
the protective system is not consistent
and compatible with its flourishing con-
dition."

Reviewing the economic legislation of the
country, Lord Beaconsfield says that at the
time the principle of protection to home
industry was abandoned, under the leadership
of Sir Robert Peel, he "believed it was a
very perilous experiment, and this feeling
was shared by large and influential parties
in both houses and the country." He as-
sures the Lords that since that time public
opinion has been decidedly modified, though
"slowly and with great precaution." Speaking
of the corn laws, Lord Beaconsfield says:
"I cannot for a moment doubt
that the repeal of the corn laws has ma-
terially affected the condition of those
who are interested in land. I don't mean
to say that the suffering condition of the
land has only been occasioned by this.
No doubt had harvests and general dis-
tress afford some reason, but I cannot
shut my eyes to the conviction that the
termination of the protection to the landed
interests has materially tended to that
condition."

When the Prime Minister of England ven-
tures such utterances as these on the floor
of the House of Lords, we may be quite
sure that the popular dissatisfaction with
the present economic policy of Great Britain
is much greater than we had supposed.
Lord Beaconsfield is not a man of such pro-
found convictions that he would venture to
defend them in utterances which would be
unpopular with the party he represents.
His tenure of office, and the success of the
very daring foreign policy which he has
undertaken to carry out, render it necessary
that he should win and retain popular ap-
plause. If, therefore, Lord Beaconsfield
concedes that there is a popular demand for
protection, and that protection is not incon-
sistent with a greater degree of national
prosperity than the country enjoys under
free trade, we may safely answer that he
speaks for a very much larger part of the
British people than have thus far been
credited with protectionist views.

In view of all the facts, would it not be
well for those who are trying to lead this
country back into free trade to wait awhile?
The British theories which they enunciate
with so much confidence, have been dis-
proved by British experience, concerning
which they appear so ignorant. The most un-
compromising enemy of domestic industry
will admit that there can be no such thing
as free trade without reciprocity, and at a
time when all the great nations of the world
are moving steadily in the direction which
we have followed so successfully during the
past 17 years, we should invite all the dis-
asters they are seeking to escape by making
the mistake they are hastening to correct.

Analysis of the Pig Iron Production of the Past Seven Years.

In considering the geographical distribu-
tion of the pig iron manufacture of the
United States, the best guide is the actual
production of pig iron by the various sec-
tions, and not the number of blast furnaces
located there. Some portions of the Union
which annually make but little pig iron are
quite liberally provided with furnaces, and
in this respect would compare very favor-
ably with other localities which have a
smaller number of furnaces, but which,
nevertheless, turn out much larger quanti-
ties of pig iron. For example, the Southern
States, excluding Kentucky and Tennessee,
have 88 furnaces, while Michigan, Wis-
consin, Indiana, Illinois and Missouri
unitedly contain only 76 furnaces; but the
latter States made 246,694 net tons of pig
iron in 1878, while the former States made
only 98,800 tons in the same year. A state-
ment of the number of furnaces in a district
would, therefore, convey no intelligent idea
of the importance of that district as an iron-
producing section, because many of the
furnaces may, from a variety of causes, be
compelled to lie idle year after year.

It may be of interest, however, to note the
relative activity of the furnaces located in
several different districts, into which we will
divide the United States in this article, hav-
ing reference in this division to some degree
of unity in business interests. In the North-
eastern portion of the Union, embracing all
the New England States, New York, New
Jersey, and that part of Pennsylvania in
which anthracite and charcoal pig iron is
made, there are 294 furnaces; of these, 44
per cent., or 130 furnaces, were in blast on
the 1st of last January. In the Southern
States, excluding Kentucky and Tennessee,
there are 88 furnaces; of these, only 22 per
cent., or 19 furnaces, were in blast on the 1st
of January. In the Western part of the
United States, including all the territory
west of Pennsylvania and Virginia, with
Kentucky and Tennessee, there are 238 fur-
naces; of these, 34 per cent., or 82 furnaces,
were in blast on the 1st of January. Included
in the last division are the States of Michi-
gan, Wisconsin, Indiana, Illinois and Mis-
souri, which we will term the "prairie
group," within whose limits there are 76
furnaces; of these, 30 per cent., or 23 fur-
naces, were in blast on the 1st of January.
In Western Pennsylvania, Ohio, West Vir-
ginia, and Kentucky, which we will call
the "Ohio group," there are 209 furnaces;
of these, 41 per cent., or 85 furnaces, were
in blast on the 1st of January. From this
statement it will be observed that the North-
eastern part of the United States contained
the highest percentage of furnaces in blast,
namely, 44 per cent.; the section embraced
in Western Pennsylvania, Ohio, West Vir-
ginia and Kentucky contained the next high-
est percentage of furnaces in blast—41 per
cent.; while the Southern States contained
the lowest percentage in blast—22 per cent.

The facts above given show the condition
of the furnaces in the various sections of
the country, and in that particular possess
some value. We shall now show, by the
statistics of pig iron production, the actual
relative importance, in this branch of the
iron trade, which each designated section
possesses, and the progress or retrogression
it has made in the past seven years. The
following table exhibits the production of
pig iron in four of the groups of States men-
tioned, from 1872 to 1878, inclusive, in tons
of 2000 pounds:

Years.	Northeastern States. Tons.	Ohio Group. Tons.	Western States. Tons.	Prairie States. Tons.
1872.....	1,450,269	875,946	914,653	101,625
1873.....	1,410,091	929,608	913,596	113,957
1874.....	1,280,477	913,509	852,781	129,008
1875.....	956,454	861,410	827,474	111,149
1876.....	817,619	876,813	788,904	68,998
1877.....	991,023	948,109	763,654	94,707
1878.....	1,150,828	1,051,382	798,231	98,800

This table presents several important
facts. The first is that 1876 was the year of
greatest depression in every section but the
Western States, in which 1877 was the year
of least production. Another fact is that
the Northeastern States are rapidly recover-
ing from a very pronounced decline, and
may be expected in another year to equal
the production of 1872 or 1873. The "Ohio
group" of States are gradually increasing
their production, and now almost equal that
of the Northeastern States. The Western
and Southern States may be said to have
just begun to recover from the depression,
having made but little advance in 1878 on
the production of 1877 or 1876. The
"prairie group" of States—Michigan, Wis-
consin, Indiana, Illinois and Missouri—have,
however, made a decidedly retrograde move
since 1872, their production in the past seven
years having been as follows, in net tons:

1872.....	384,364	1876.....	283,376
1873.....	374,488	1877.....	254,804
1874.....	354,049	1878.....	246,694
1875.....	308,504		

The relative production of the various sec-
tions herein alluded to may be more forcibly
indicated by the following table, which
shows the percentage of the total production
of the United States that each district made
each year since 1872:

Years.	Northeastern States. Group.	Ohio States. Group.	Western States. Group.	Prairie States. Group.
1872.....	51	39	4	14
1873.....	49	34	4	13
1874.....	48	34	5	12
1875.....	42	38	5	14
1876.....	40	42	3	14
1877.....	43	41	4	11
1878.....	45	41	4	10

From the statements thus presented it
will be observed that only the Western
States—including, of course, the "prairie
group"—continue to exhibit a falling off in

production, either absolutely or relatively.
Even the Southern States have regained the
position they occupied in 1872 and 1873,
though they yet manufacture but a very
small part of the pig iron made in the
United States. The Northeastern
section may be termed the "old reli-
able;" it has rallied from the very
low production of 1876, and is coming
forward rapidly every year. The trade of
the Northeast seems to rest on a solid basis
of well-equipped furnaces, supplied with ore
and coal within reasonable distances for the
most part, and surrounded by all sorts of es-
tablishments which work up pig iron. The
"Ohio group" of states rivals the Northeast
in the production of pig iron, and the trade
of that section must continue to grow from
year to year, as it not only has peculiar ad-
vantages in the possession of good and cheap
furnace fuel, but the consumers of pig iron
there located are making great efforts to sup-
ply their own wants. We would be glad to
chronicle the equal progress of the rich
South and the great West with these two
northern sections, but the statistics that are
here presented do not indicate such a mea-
sure of activity in the iron trade of the
South and West as we hope to see at no dis-
tant day.

Do Freight Wars Pay?

The present freight war, which is regarded
as such a blessing, will be found in the end
to be a positive evil to the business of the
country. It is unquestionably desirable that
there should be a healthy competition for
the carrying trade. It is necessary to the
existence of commercial and manufacturing
centers, that they should have the lowest
rates of freight consistent with safe car-
riage and a fair return to the stockholders
of the carrying lines. In a country like
this, where distances between points of
production and consumption are so great
that charges for transportation must always
be a heavy tax, every effort put forth to
honestly reduce these charges to a minimum
is commendable, and the public will hail with
delight every legitimate reduction; but when
reductions are not the results of reduced cost
of moving freight, but rather the offspring
of some petty spite, or made in the hope of
gaining some advantage over rivals, the case
is different, and sound business principles call
for the untimely condemnation of such re-
duction and the immediate return to a rate
justified by the cost of moving the freight.
It is always an indication of an unhealthy
condition of trade to sell an article at a lower
price than that at which it can be repro-
duced, and this is true of freights. To sell
the transportation of a ton of freight 1000
miles for 8 cents, when the coal to move this
freight this distance cannot be replaced for
anything like this amount, is a violation of
all sound rules of business. Some one has to
endure this loss. A locality or a trade may
for the time reap some benefit, but sooner or
later, in one way or another, they must pay
for it. This advantage is only temporary—
the disadvantage is apt to be much more
permanent.

But while this advantage is accruing to
some section or trade, at the same time the
business of the country suffers, and additional
and vexatious burdens are imposed upon it.
The worst of these burdens is the unset-
tling of values at the points of distribu-
tion and consumption. If John Smith, of
Chicago, buys a stock of iron and nails when
freights are 20 cents per 100, and two days
after John Jones, of the same place, as the
result of a railroad war, gets his iron and nails
laid down at 8 cents, the latter can sell his
goods at just what they cost his competitor
in business and make what is a good profit
on that class of merchandise. Again, if the
Chicago merchant has, say, an 8 cent rate on
these heavy goods, while St. Louis pays 20
cents or 25 cents, the markets in which
these two cities compete will be demoralized
at once, and no advantage will accrue to
anyone as the result of these low figures. It
may be argued that these are risks that
one must take in his business, and that in
marking goods allowance must be made for
such risks. All this may be true, and in
fixing prices on goods the careful merchant
always allows for the decline in goods aris-
ing in the natural course of business; but
this reduction, arising from a freight war,
cannot be foreseen and cannot be provided
against. It is an extraordinary risk, and
unsettles and demoralizes the market when
a decline from legitimate causes would not.
It is this uncertainty that makes it such a
grievous burden, while at the same time it
makes it impossible to reap benefit from it.

It always happens, after one of these fights,
that the parties to it get together and rates
are advanced. Oftentimes the object sought
in entering such a contest is to bring about
some pooling arrangement. When this is
accomplished the gainers in the fight become
losers. All the advantage, and generally
more, is lost. At their leisure the roads pro-
ceed to pluck the goose. The poor innocent
who congratulated himself at the time of
the fight that he was so wise and the rail-
roads were such fools for his advantage,
finds that the gift he supposed he was get-
ting was only a loan that must be repaid
with interest. Now, this is neither sound
nor safe. Indeed, such a policy is so
rotten and weak that every business man
who cares to do business on a safe, legiti-
mate basis, and not to take risks that are
equal to those of a stock broker, should
utterly condemn it. What the country needs
is, as low rates of freight as can be given,
consistent with a fair return for the work

done. What it does not need is freight
wars.

Steel from Common Pig.

Much of what has been said and written
within the last few weeks on recent de-
velopments in the manufacture of steel,
tends to create a false impression in the
minds of those persons who, being inter-
ested only indirectly, have not gone into
the metallurgical details, and it would seem
that even the judgment of many who have,
has been warped. The general public,
as well as the trade, has been favored with
elaborate prophecies as to the turn which
affairs will take in the near future. The
rapid course which the steel industry has
taken in all civilized countries, seemed to be
stayed only by one barrier—the increased
cost of the production of pig fit for conver-
sion into serviceable steel—and that obstacle
is now removed. Early and costly ex-
perience taught Bessemer steel manufac-
turers that only a fraction of the pig metal
produced from common ores, with ordinary
fuel, was available for their purposes; and
Bessemer was in the outset of his experi-
ments, after one brilliant success, driven
almost to abandonment of his process by his
failure to repeat it with inferior material.
Development in this direction, both in this
country and in Europe, was at first tenta-
tive; brands of pig were tried in turn, and
thus a selection was arrived at. Then
chemists were called upon to search for the
causes of the differences thus established,
and when it was ascertained that phos-
phorus appeared in most cases in quanti-
ties surpassing certain limits, the aim of
smelters became the production of metal
low in phosphorus. They were eager, in
consequence of the higher price of Bessemer
pig, to meet the demands of the steel
manufacturers. This could only be at-
tained by a careful selection of the raw
materials, as the chemical reactions in the
blast furnace are such that the greater
part of the obnoxious metalloids is carried
into the iron. Search had therefore to be
made for ores low in phosphorus, with
what results it is hardly necessary to point
out. Ores were brought from great dis-
tances, so that Bessemer pig commanded a
considerably higher price than the make of
furnaces smelting ordinary ores. The efforts
to overcome this evil were as numerous as
the different stages through which the metal
passes until it is finally turned over to the
consumer as steel. The ore itself was
treated mechanically and chemically before
being charged into the furnace. Other ex-
perimenters attempted to drive the phos-
phorus out during its passage through the
blast furnace, while a large and growing
class of practical men, as well as chemists,
believed that purification of the pig would
offer an efficient, simple and cheap means
for preparing any metal for the exacting
conditions of the process.

The careful and elaborate investigations
which have grown out of these efforts to
dephosphorize the pig previous to its con-
version, have thrown so much light upon the
chemical relations of the constituents of the
pig at varying temperatures, that the greater
part of the data which explain or point out
the dangers or limitation of the new process,
is gathered from them. Prominent among
these are the researches of I. Lowthian
Bell, which will serve as the best basis for
criticism and comment. When air is blown
into pig iron, the silicon contained in it is
converted into silica, or silicic acid, chemi-
cally speaking, and similarly phosphorus is
oxidized to phosphoric acid, which, combin-
ing with oxide of iron formed simultane-
ously, would form a phosphate of iron. The
latter would go into the cinder if it
were not for the presence of a large amount
of silicic acid, which possesses the power, at
high temperatures, of separating the phos-
phoric acid from its base. From a considera-
tion of the refining and puddling processes,
Mr. Bell deduced that, in the oxidation of
phosphorus, the first step of its elimination
appears to take place in the inverse ratio of
intensity of temperature. He urged also
that when the silica is lowest in the cinder,
and there has in consequence been an ex-
cess of basic materials, the amount of phos-
phorus is greatest. The question arose, there-
fore, whether the separation of phosphorus is
favored by moderating the heat or by impeding
the presence of silica. The former
method would necessitate the elimination of
the phosphorus at temperatures lower than
that of the Bessemer converter, and would,
therefore, call for purification of the pig pre-
vious to its being blown in the ordinary
manner. Mr. Bell, recognizing the impor-
tant function played by oxide of iron in the
process of refining and puddling, in which
silicon, phosphorus and sulphur are largely,
or entirely removed, developed his process
of treating the pig with molten oxides of
iron. The second method, that of impeding
the presence of silica, is that adopted by the
processes of Thomas & Gilchrist, Snelus and
Riley.

The sources from which the silica enter-
ing into the cinder of the Bessemer con-
verter was drawn, were hitherto twofold.
A part was obtained through the oxidation
of the silicon in the pig, and this amount
cannot be touched, because the combustion
of the silicon furnishes the heat necessary
to maintain the metal in a fluid condition.
Another portion of the silica was taken from
the lining. The supply of silica entering
into the cinder in this manner could be cut
off by changing the nature of the lining,
and this is what the inventors of the new

Processes have accomplished, according to recent advice. They have succeeded in making a refractory durable lining of lime. The process of Messrs. Thomas & Gilchrist may, in a measure, be considered an intermediate one between Bell's process and that of Snellus. The former gentlemen add basic materials—a mixture of oxide of iron and lime—while Mr. Snellus relies upon his lining alone to furnish the basic material for carrying the percentage of silica in the cinder low enough to make the phosphates formed stable compounds at the given high temperatures. About a year ago, when Mr. Bell read his paper on the process developed by him, Prof. Williamson suggested the substitution of a part of the oxide of iron by lime, so that this modification of the process would approach the method of Messrs. Thomas & Gilchrist, who, by adding the feature of a basic lining, made the use of the Bessemer converter itself possible. The difference between the process of the latter gentlemen and that of Mr. Snellus, is that they strive to avoid a rapid destruction of the lining by its being dissolved by the cinder through the agency of their additions. With them the substitution of lime for silica bears more the character of a preventive measure. Mr. Snellus makes the lime lining act both as a refractory material and as a dephosphorizing agent; that is, the lime of which it is composed is carried into the slag in amounts large enough to reduce its contents in silica, obtained through the combustion of the silicon of the pig, to such a limit that phosphoric acid can enter into it as a stable compound. While it seems that the slag resulting during the Thomas & Gilchrist process is higher in lime, the Snellus slag draws for a larger portion of its basic material upon the iron of the pig oxidized during the blow. What the proper proportions of lime to oxide of iron in the slag are for every given case, experience must teach; and it is also a matter to be determined by trial what is the limit of saturation with phosphoric acid which the slag will bear. Naturally the highest degree of saturation may by no means be the most advantageous, as the power of the slag to absorb additional quantities of phosphorus must rapidly decrease. Another question which will require settlement, is how high the percentage of silicon in the pig may be permitted to go without requiring too large an amount of lime for its counteraction; and, on the other hand, how low the silicon may fall without danger of the formation of skulls. It will be desirable, of course, to confine the basic addition to as small a bulk as possible, and it will therefore be a nice question how far the slag will be allowed to recruit itself from the lining. Messrs. Thomas & Gilchrist hold that the density of the lime brick will prevent it from playing an important part in the removal of phosphorus.

There can be no doubt as to the success of the substitution of lime for silica in simultaneously effecting the removal of carbon, phosphorus and silicon from pig in the Bessemer converter, and, combined with recent successes in a somewhat different direction, it may be confidently stated that the troublesome phosphorus has been finally brought within the power of metallurgists. While many inventors and investigators were seeking the solution of the phosphorus problem in methods designed for its removal, another class was striving to expand the narrow limits to which its presence was confined. So long as the Bessemer process was the only one in use, and spiegel containing only from 10 to 12 per cent. of manganese was employed, and so long as it was deemed essential that rail steel should have 0.4 per cent. of carbon, any phosphorus exceeding 0.1 per cent. was considered dangerous and inadmissible. When, however, ferromanganese commenced to take the place of spiegel in the open-hearth process, the Terre Noire engineers succeeded in replacing a portion of the carbon by phosphorus, so that they increased the limit for serviceable rails to 0.25 phosphorus by decreasing the carbon to 0.2 per cent., and making the manganese not less than 0.7 per cent. In this direction interesting and elaborate experiments were also made by Alex. L. Holley, who carefully examined the conditions under which steel high in phosphorus could be shaped into the desired forms. These French and American researches proved that a considerable portion of a material hitherto debarred from being used for steel, notably old rails, could be used without danger.

The great phosphorus problem may therefore be considered as solved. That the new processes will still further and rapidly contract the sphere of usefulness of the puddling furnace, there can be no doubt. Our present purpose is, however, so far as the data given will admit, to afford the means of judging the present methods of effecting the great changes which are imminent. To the latter we will refer at an early date.

We are informed by Mr. Crane, President of the United Manufacturers' Association, now dissolved, the defendants in the recent nickel-plating suits, that the members of the association have stopped the suits pending, paid damages, and taken out licenses under the Adams patent. Our readers will remember the main features of this important case, which covers not only the process of nickel plating, but makes the manufacturers of any article nickel plated liable to an injunction. Suits brought have been

decided in favor of the owners of the Adams patent at three different times, the last having been that before Judge Blatchford, whose decision was printed in full in *The Iron Age* of Dec. 5, 1878. Judge Blatchford afterward virtually granted a rehearing, during which eminent counsel, among others Senator Conkling, argued for the manufacturers. The judge's decision, however, was again favorable to the United Nickel Company, who hold the Adams patent. The latter, we hear, have made terms which have proved mutually satisfactory. The action of the manufacturers' association, we presume, virtually settles the matter, as few individuals will be in a position to carry it further than the association has found it wise to do.

We print on another page a short summary of the different routes submitted to the Paris Commission for investigating the feasibility, and probable cost, of the various schemes proposed to connect the waters of the Atlantic and Pacific oceans by a ship canal. The figures and data given in our article are those presented by the promoters of the projects and their engineers. As such, they are liable to suffer considerable amendment and alteration before they are finally adopted; and it would seem, so far as it is possible to judge from the conflicting nature of the telegraphic dispatches in the daily press, that the commission does not by any means share the sanguine views of the projectors as regards cost of construction. The committee appointed estimated the Darien route at \$200,000,000, the two Panama routes at \$221,000,000 and \$268,000,000 respectively, and the Nicaragua route, taking the average of the Menocal plan and the Blanchet plan, at \$125,300,000.

As to time, the transit by Darien is computed at three days, those of the two Panama lines at one day and one half and a half respectively, and that of the Nicaragua way at four and a half days. The latter has the great advantage of being much nearer to Europe and the American ports, and of being located in a healthy climate. The annual saving in money to the trade of the United States is estimated at \$35,000,000; to that of England at \$10,000,000, and to that of France at \$2,000,000, figures which sufficiently indicate the importance of a canal.

It is announced by telegraph that Prof. Nordenskjöld, the Russian arctic explorer, has safely arrived with his expedition in Behring's Straits. He has thus succeeded in establishing the important fact that there is a passage along the northern coasts of Europe and Asia. The practical value of this discovery is greater than it might seem at first sight. When, however, it is considered that at certain seasons the route is clear of ice, and that when once well known the passage will be much more readily and rapidly made, it will be conceded that this new route is likely to affect the commerce of the northern nations more favorably.

On Monday the boilers of Pittsburgh presented the scale of wages agreed upon by them for the next year to the manufacturers, and asked that it be signed. In every instance this was refused. The scale is the same as published by us last week. There is some possibility of a conference and an adjustment of the difficulties, but in these affairs it is exceedingly difficult to predict what the solutions of the questions will be.

The great trunk lines continue their ruinous course. On Monday the rates from Pittsburgh were reduced to six cents per cwt. to Chicago, six cents to New York and four cents to Cleveland. Before the freight war broke out they were fifteen cents to New York and Chicago and thirteen cents to Philadelphia, prices which prove that the present tariff cannot yield a profit to the companies.

On Tuesday the Wheeling, Pa., nail manufacturers notified the nailers that the scale now ruling was not satisfactory, and asked for a conference with the men, which will be held on Saturday, the 31st.

The Physical Properties and Chemical Composition of Steel Rails.

In our recent report of the proceedings of the Pittsburgh meeting of the American Institute of Mining Engineers, we promised the readers of *The Iron Age* a full and early account of the adjourned discussion of Dr. Dudley's paper, "The Physical Properties and Chemical Composition of Steel Rails." The discussion, which was expected to be the most important business of a scientific nature before the meeting, was opened by the reading of the following paper, prepared by Mr. J. W. Cloud, of Altoona, Pa., in which he seeks

A MATHEMATICAL SOLUTION OF THE QUESTION.

For the purpose of drawing the most valid conclusions that could be obtained from the limited number of specimens of Bessemer steel given in Dr. Dudley's paper, Mr. Cloud had taken 23 of his 25 analyses, and had formed 23 equations between the content, as shown by chemical analysis, on the one side, and the length of diagram given on the other side. He had solved the 23 equations thus formed by the method of least squares for the most probable influence of a unit of each substance in the steel on the length of the diagram. A second series of equations was similarly formed, but with the height of diagrams substituted in the right-hand member of the equations in place of the length of diagram. These and a third series, having as right-hand member the height of diagram at the elastic limit, were solved for the most probable effect of a unit of each substance contained in the steel on the height of diagram, and on its height at the elastic limit.

Mr. Cloud then briefly recalled the facts bearing upon the diagram as a record for the strength of the metal submitted to torsional test. As a unit of each substance in the steel, he assumed one-hundredth of one per cent., and respectively also considered one-hundredth of one inch a unit of measurement on the diagram. Letting u be equal to the influence of one unit of iron on the length, height or elastic limit of the diagram, and v , x , y and z that of carbon, phosphorus, manganese and silicon respectively, three sets of 23 equations are obtained, of which the following series is an example:

$$9906u + 34v + 8x + 46y + 6z = 1370 = 311 = 115. \\ 1370, 311 \text{ and } 115 \text{ are the length, height and elastic limit of the diagram in one-hundredth of an inch. The solution of these equations gave Mr. Cloud the three following systems of values, with their proper and necessary signs, which mean that the substance represented by each letter increases or decreases the measurement of the diagram under consideration, according as the sign is plus or minus, and at the rate given by the figures:}$$

	Elongation.	Tensile Strength.	Elastic Limit.
u	+ 0.257	+ 0.019	+ 0.008
v	- 92.54	- 1.191	- 1.131
x	- 15.8	- 3.212	- 0.409
y	- 3.604	- 0.342	- 0.086
z	+ 39.8	+ 6.292	+ 0.548

These three systems of values he compared with the original right member by substituting them back into the original equations. By this method he has succeeded in ascribing to each element its most probable share in quality and magnitude in the final result. From the values found, which will require further confirmation, as the data are not numerous as yet, it would appear that manganese is a miniature phosphorus, having a similar influence on the elastic limit, tensile strength and elongation. It has much less influence than phosphorus, its effect on decreasing the elastic limit and elongation being one-fifth as great as that of phosphorus, while its influence on increasing the tensile strength is only one-tenth as great as that of phosphorus. It would seem, also, that manganese is the only one of these substances in question which resembles phosphorus in action right through. Carbon is similar to phosphorus as to tensile strength and elongation, but it has a value of large magnitude opposed to phosphorus as to elastic limit. Silicon, it appears, is opposed to phosphorus, and acts as an antidote to it, and to manganese as regards elongation and elastic limit, but is with them in increasing tensile strength, and that at a high rate. In conclusion, Mr. Cloud regretted the meagreness of the data presented thus far, and promised to communicate something more in this direction at a future meeting.

Dr. Dudley in reply said he would make a few adverse criticisms as a means of calling more attention to the matter, as he did not quite agree with Mr. Cloud's mathematical views. He questioned whether there is anything equitable between the chemical contents of the steel expressed in hundredths of one per cent., and the elongation of the diagram expressed in hundredths of inches. To his mind a diagram, being a record of the tensile strength and elongation, is a resultant belonging principally to the iron modified by the constituents in the steel, namely, carbon, phosphorus, silicon and manganese. If a diagram obtained from pure iron could be checked with the test diagrams published, and the differences between them could be reached, figures equitable with the constituents entering into the steel could be got. For example, if a pure iron should give a diagram 50 inches long, while the length of a diagram of a piece of steel were only 15 inches, some difference in the constitution of the two would be the cause of the modification. To his mind these ingredients seem to have divided the diagram obtained between themselves. Thus, if one-hundredth of one per cent. of iron gives, as per Mr. Cloud's table of values, an elongation of 0.23 of an inch, 100 would yield a diagram of about 23 inches. This is a short diagram, even for steels containing as high as 0.10 per cent. of phosphorus, 0.35 to 0.40 per cent. of manganese, and 0.455 per cent. of carbon. A diagram of carbon alone would be 29.54 inches minus—that is, no diagram at all—and this would apply similarly to phosphorus and manganese, both of which have minus signs. The values for these constituents, he urged, had been arrived at by regarding them in a parallel way with iron, by which proceeding the values of some of the principal substances would not give a diagram at all—they would give a negative diagram. He repeated his doubts as to the equitability between the unit of measurement of the diagram and the contents expressed in hundredths of one per cent.

President Eckley B. Coxe deemed the point struck by Dr. Dudley one of great importance, as he thought the only proper way would be to get the diagrams of pure iron—of iron combined with a certain amount of carbon, of phosphorus, &c., singly and in combination. He urged that attention be paid to the question as to the condition in which the injurious substances and metalloids are present in the iron, and gave expression to the suspicion that a number of the rails contained a good deal of copper, the action of which he thought it would be important to know.

Dr. E. W. Raymond remarked that Dr. Dudley's arithmetical objection that there was nothing equitable there, would be deprived of much of its force if the author of the paper had worded the equations a little more carefully. The figures need not be changed at all, but, instead of saying u stands for iron, he might begin by basing the whole calculation on the assumption that, if a given minute weight of a given ingredient has a certain measurable quantity of effect, then twice that weight would have twice that effect. It is assumed, first of all, that if a certain amount of iron possesses a certain effect, twice that ingredient will produce twice that effect; u stands for the effect of a unit of iron, and v for the effect of a unit of the next element, so that, if these units are added together, a sum is arrived at which is, in some way or other, a function of the measurement of the diagram, and Dr. Dudley would be entirely justified if the letter m were written before (a) unknown quantity. The latter would appear in every part of the table and

would not hurt anything. Dr. Dudley's criticism, he thought, applied to the way of reading the equation. It was a question, not of results, but of relations. Dr. Raymond said that the only point to which he wished to reply was the statement that there was not a fair basis for calculation, simply because there was no arithmetical equitability.

Mr. Holley stated that while there was no doubt that the method of taking as pure iron as could be obtained and putting certain ingredients into it for the purpose of measuring their effect, was the only proper one for reaching a correct result, it should not be forgotten that Messrs. Hedges, of England, had tried the plan and failed. Even the purest iron that could be had contained slight amounts of impurities, sufficient to affect the result. What was wanted was synthesis as well as analysis. Both Messrs. Miller, Metcalf & Parkin, of Pittsburgh, and the United States Test Board had spent much money in endeavoring to find some way of obtaining pure iron and introducing the desired ingredients.

Mr. Metcalf then submitted to the learned men assembled the following problem for solution. After a careful and thorough test of two rival steels, made by a competent party, one of the two was pronounced perfectly worthless, the other the best he had ever seen. An analysis was made of both of them with the following results:

Carbon.....	0.865	0.865
Silicon.....	0.018	0.018
Phosphorus.....	0.017	0.022
Total.....	0.900	0.903

Mr. Metcalf called upon the members to decide which was the best and what was the matter with them.

Dr. Egleston thought the question propounded by Mr. Metcalf a remarkable one, but stated that similar questions had come to his knowledge a great many times. He urged that as there were many physical and mechanical qualities deserving of a place in the discussion, it was time that the chemists surrendered some part of the field to be occupied by physicists.

Dr. Raymond in reply forcibly pointed out that the chemical and physical investigations are inseparably combined, and that an indispensable requirement for samples which are to be chemically investigated was that they be manipulated exactly alike physically and mechanically. The absence of such uniformity introduced some uncertainty into Mr. Cloud's deduction, who had frankly admitted that to be the greatest fault connected with his attempt to supply a new method of investigation.

This was followed by the reading of notes on the dephosphorization of pig by Messrs. Maynard and Raymond, the former speaking on the Thomas-Gilchrist's process and the latter on Snellus's early experiments with a basic lining. Some discussion followed, in which Mr. Jacob Reese, of Pittsburgh, related his early experience with a "reversed Bessemer process" and the findings used in connection with it. His remarks we print in another column, as they are full of interesting data.

Mr. W. R. Jones, of the Edgar Thomson Steel Company, read as a contribution to the discussion, the following paper

ON THE CHEMICAL COMPOSITION OF STEEL RAILS, THEIR MANUFACTURE AND MECHANICAL TREATMENT.

Mr. Jones stated that after firing a few guns at the Baltimore meeting he did not have the intention of taking part in any further discussion, until the charges that American steel rails are inferior to those of English make, made on the occasion of the purchase of foreign rails by Mr. Vanderbilt, forced him for one to refute them. He gave a brief résumé of the causes that led to the investigation of Dr. Dudley. He commended the Pennsylvania Railroad for the good sense and the desire to aid in getting at the true facts in the case, and regretted that the rail manufacturers did not meet the company in the same spirit. It was suggested by Mr. Wm. P. Shinn, at an unsatisfactory meeting at Altoona of the officials of the company and the manufacturers, that Dr. Dudley present a paper before the Institute of Mining Engineers, in order to bring about a full discussion of the subject. This had been but partly realized thus far, as two Bessemer steel works only had been represented in the discussion. Since the Baltimore meeting, at which Mr. Jones had stated that "there was no question but that Dr. Dudley's formula would make a good rail, and that this fact could not be controverted as the rails had been fully tested in the track," he had discovered that Dr. Dudley had modified his formula by allowing the manufacturers to use their own judgment in regard to the percentage of copper and sulphur. This he held made the formula absolutely worthless, as in his opinion, based upon close observation, phosphorus had been made the bugaboo of steel, while too little attention had been paid to the real evils, sulphur and copper. He exhibited a rail which had been probably in the track of the Pennsylvania Railroad for three years, and from which large pieces had fallen while in service. The lack of homogeneity of this bad rail, he claimed, was an excess of both sulphur and copper and a lack of manganese to neutralize their bad effects. He showed also an ingot having large cells or honeycombs, from which a serviceable rail could not be made. Its analysis was:

Phosphorus.....	0.111
Carbon.....	0.36
Manganese.....	0.26
Silicon.....	0.022

A sound ingot free from porosity, sponginess or honeycombs, as hard as is compatible with safety, was the first thing toward making a good serviceable rail. He exhibited two pieces of ingots as fair samples of the rail steel made by the Edgar Thomson Steel Co., Limited, and claimed that after the introduction of numerous improvements, they made the Bessemer process a reliable process for manufacturing steel containing carbon as high as 0.70 and as low as 0.04. He attributed their success in attaining with ease the largest output of any similar works in the world (2000 to 2300 tons of ingots per week) to the excellence of the machinery, to the system of working, and to closely watching the machinery and not allowing it to deteriorate.

All the steel is subject to compression by steam, and as an instance of the merits of that process he cited the following experiment: A mold was filled to within 8 inches of the top and covered; the one next to it was poured to the same height and subjected to a steam pressure of 150 pounds to the square inch. On removing the ingots they found that the first one, poured without compression, had swollen and filled the mold entirely, while the one subjected to the pressure had been forced down from 1 1/4 to 2 inches. Mr. Jones claimed that the "bottom cast" system was responsible for much of the bad work done by American works; that the system was abandoned at the Edgar Thomson Steel Works, because it was found that the "bottom cast" renders one end of each rail liable to split ends, the top end from piping and the lower end from bleeding. Being one of the quartette of patentees, he said he could be credited with being honest in his condemnation.

Returning to Dr. Dudley's formula, he cited the case of a John Brown steel rail, which had, in the Baltimore and Ohio track, given 11 1/2 years' good service, outliving a tonnage of 55,000,000 tons. Its analysis is:

Phosphorus.....	0.069
Carbon.....	0.36
Manganese.....	1.04
Silicon.....	0.124
Sulphur.....	0.071

This calls for a total of 53 phosphorus units. Other samples of this steel showed:

Manganese.....	0.870 to 1.075 and 0.774
Silicon, ranging from.....	0.025 to 0.187
Carbon.....	0.026 to 0.39
Phosphorus.....	0.50 to 0.104

All these rails did good service. Mr. Jones stated that he would not attempt to prescribe any particular formula unless conversant with the iron to be used, and that the formula should be changed to meet their characteristics. The exhibited specimens of rails are of the following composition:

Phosphorus.....	0.223
Carbon.....	0.32
Silicon.....	0.025
Manganese.....	0.887

which, tested by the Thurston machine, showed:

Tensile strength at elastic limit.....	39,750 lbs.
Ultimate tensile strength.....	78,892 lbs.
Elongation.....	37.9 per cent.
Angle of torsion.....	174 degrees.
Phosphorus units.....	35.9

The bent specimen was subjected to a drop test of 36 feet, the ram weighing 1620 lbs. with bearings, being 3 feet from center to center.

The composition of this steel is a near approach to the Terre-Noire formula—high phosphorus, low carbon and high manganese—which, according to the testimony of prominent officials of leading American roads, showed an excellent record. All of this, Mr. Jones argues, goes to show that good steel can be made from quite a variety of formulae, and that phosphorus is not as bad as it has been made out, while two worse miscreants, sulphur and copper, have been entirely overlooked. He would allow the chemical analysis of the steel to be dictated outside of phosphorus, copper and sulphur, reserving the determination of the proper amount of carbon, silicon and manganese for himself. Unless the railroad officials had reason to be satisfied that the manufacturers did not understand their business or were dishonest, it would be folly on their part to dictate to manufacturers. He said that he would undertake to fill an order for the Pennsylvania Railroad under its present specifications—carbon between 0.30 and 0.50—and guarantee every rail to break in service, and yet they would be compelled to accept them by the terms of their contract and their specifications. Mr. Jones stated that Mr. Dudley's formula has been extensively appropriated, and that railroad officials, after obtaining large quantities of excellent rails, exposed themselves to the acceptance of a bad material by prescribing Dr. Dudley's formula. Mr. Jones then quoted at length a letter published some time ago by Mr. Sweet, who claims that the alleged inferiority of the American rails is due to mechanical causes; that English rails are better because they are rolled colder, the consequence of slower work in a two-high train, and that American rail makers should use a polished chilled roll for the three last passes.

Mr. Jones could not see any necessity for the luxury of chilled rolls, and cited cases of Troy and Edgar Thomson rails which had given as good results as the very best foreign rails. He thought Mr. Sweet's assertion that the English roll colder could not be sustained, and that it is erroneous to suppose that because they use two-high trains they roll slower. He did not believe that if Mr. Sweet owned or controlled a rail mill he would long continue to use chilled rolls. He would find that, when tested, the rails thus made would show an infinitesimal elongation, but that the elongation of Mr. Sweet's countenance would compensate for it. He said that there had been some confusion, and he wanted it to be decided at once whether the cold rolling should be done before the annealing or the annealing before the cold rolling.

Dr. Dudley, in reply to the argument of Capt. Jones, called attention to the fact that he had in his original paper recommended that no specification be prescribed for sulphur, because a piece of steel containing too much of that substance would become red-hot and could be rolled only with difficulty. He believed that Capt. Jones would agree with him when he stated that steel containing not over 0.30 per cent. of carbon, not over 0.10 per cent. of phosphorus and not more than 0.34 per cent. of manganese, could not be rolled if too high in sulphur. When the paper came to be published, copper was included with the sulphur, as he believed that the former acted much like the latter by making the metal red-hot. He would not express an opinion on the subject of the effect of sulphur and copper on the wearing power of steel; he thought that it affected the manufacturer more than the buyer. Capt. Jones, he said, did him full justice in stating that he (Dr. Dudley) had brought the matter forward with the intention of trying to get better steel. He should be more than gratified if they succeeded ultimately in advancing their knowledge of steel as regards its wearing qualities, no matter whether the formula he had given did or did not make the best rail.

Trade Report.

Office of THE IRON AGE,
WEDNESDAY EVENING, May 20, 1879.

During the past week the Wall street market have been very active. Government bonds were strong during the early part of the week, but have fallen off somewhat. The transactions in the 4 per cents have been large at 103. The syndicate have been out of the market, owing to the fact that they have advanced the price to the equivalent of 104 @ 1/2. There is a growing disposition on the part of speculators to sell the bonds short; and, on the other hand, the banks are buying in increased quantities when they would not buy from the syndicate. It is announced that the Treasury will redeem in June the called bonds that mature in July, and without rebate, and is ready to redeem at once, without rebate, those that mature in June. The sale of the 4 per cent. refunding certificates is now stopped in the Atlantic cities and in Washington. The remainder, some fourteen millions, is reserved for sale in the interior. The ruling rate for call loans on ordinary Stock Exchange collateral is 4, and on United States bonds 2 1/2 @ 3. Prime mercantile paper is 3 1/2 @ 4 1/2. Silver advanced in London to 51d. per ounce. The bullion value of the 4 1/2 grain dollar is up to 086 1/2.

Railroad investments are strong. Speculative stocks and bonds are also strong. Toward the close St. Paul and Wabash declined, but there was an advance in the market. The most active stocks during the day were Erie and Northwestern. Quotations at the close are given below.

The bank return shows a decrease of \$5,057,725 in surplus reserve, which now stands at \$25,500,000, against \$14,104,675 at this time last year, and \$18,500,050 at the corresponding period in 1877. The loans show an increase this week of \$3,798,000; the specie is up \$38,500; the legal tenders are decreased \$5,866,000; the deposits other than United States are down \$3,079,100, and the circulation is up \$171,200.

The following is an analysis of the bank totals of this week compared with that of last week:

	May 17.	May 24.	Comparisons.
Loans.....	\$23,828,500	\$25,500,000	Inc. \$1,671,500
Specie.....	18,763,900	18,802,400	Inc. 38,500
Legal tenders	40,150,900	43,384,900	Dec. 3,234,000
Total reserve	\$72,743,300	\$87,687,300	Dec. 14,944,000
Deposits.....	\$29,444,700	\$27,345,000	Dec. 2,099,700
Reserve re-quired.....	57,606,175	56,836,400	Inc. 769,775
Surplus.....	15,137,125	30,850,900	Inc. 15,713,775
Circulation.....	12,686,400	12,857,600	Inc. 171,200

The foreign trade movements at the port of New York since our last issue are shown in the following tables:

IMPORTS.			
	1877.	1878.	1879.
Dry goods.....	\$744,260	\$846,040	\$1,019,354
General mds.....	6,038,421	3,413,583	4,474,475
Total for week.....	\$6,782,681	\$4,260,532	\$5,493,829
Prev. reported.....	128,829,644	112,722,137	130,847,908
Since Jan. 1.....	\$135,612,395	\$116,982,669	\$126,391,731

Included in the imports were articles of merchandise valued as follows:

	Quantity.	Value.
Aminals.....	287	\$4,100
Brass goods.....	4,519	1,206
Bronzes.....	1,206	1,206
Chains and anchors.....	23	537
Cultery.....	3,559	8,266
Guns.....	38	8,266
Hardware.....	89	89
Iron, pig, tons.....	500	6,219
Iron, sheet.....	547	547
Iron ore, tons.....	4,548	13,498
Iron, other, tons.....	458	13,498
Metal goods.....	112	13,498
Needles.....	6	4,174
Nickel.....	285	179
Old metal.....	179	179
Platina.....	3,679	4,100
Percussion caps.....	39	4,100
Saddlery.....	13,375	13,375
Steel.....	13,375	13,375
Silver ore.....	16	611
Tin, bxs.....	127,144	127,144
Tin, 14,700 slabs.....	1,295,963	1,295,963
Wire.....	4,519	4,519

EXPORTS, EXCLUSIVE OF SPECIE.

	1877.	1878.	1879.
For week ended May 27.....	\$4,827,590	\$5,605,866	\$5,724,627
Prev. reported.....	101,874,011	133,702,070	151,124,335
Since Jan. 1.....	\$106,699,601	\$140,367,066	\$126,406,862

EXPORTS OF SPECIE.

	1877.	1878.	1879.
For week ended May 24.....	\$4,666,914	\$4,666,914	\$4,666,914
Previously reported.....	7,748,976	7,748,976	7,748,976
Total since January 1, 1879.....	\$12,415,890	\$12,415,890	\$12,415,890

The closing quotations of Government bonds were as follows:

	Bid.	Asked.
U. S. Currency 6's.....	125 1/2	125 3/4
U. S. 6's 1880 registered.....	106 1/2	106 3/4
U. S. 6's 1880 coupon.....	106 1/2	106 3/4
U. S. 6's 1881.....	107 1/2	107 3/4
U. S. 6's 1881 coupon.....	107 1/2	107 3/4
U. S. 5's 1881 registered.....	103 1/2	103 3/4
U. S. 5's 1881 coupon.....	103 1/2	103 3/4
U. S. 4 1/2's 1881 registered.....	103 1/2	103 3/4
U. S. 4 1/2's 1881 coupon.....	103 1/2	103 3/4
U. S. 4's 1897 registered.....	103 1/2	103 3/4
U. S. 4's 1897 coupon.....	103 1/2	103 3/4

The following were the closing quotations of active shares:

	Bid.	Asked.
American District Telegraph.....	60 1/2	60 3/4
Atlantic and Pacific Telegraph.....	39	40
Burlington and Quincy.....	216	216 1/2
Bur. Cedar Rapids & North.....	35 1/2	35 3/4
Canada Southern.....	59	59 1/2
Canton.....	44	44 1/2
Col. Chicago and Indiana Central.....	64 1/2	64 3/4
Clev. Col. Cin. and Indianapolis.....	51 1/2	51 3/4
Cleveland and Pittsburgh.....	96 1/2	96 3/4
Chicago and Alton.....	89 1/2	89 3/4
Delaware, Lack. and Western.....	57 1/2	57 3/4
Delaware and Hudson Canal.....	49 1/2	49 3/4
Express-Adams.....	107 1/2	107 3/4
Express-American.....	47 1/2	47 3/4
United States.....	46 1/2	46 3/4
Wells, Fargo & Co.....	97 1/2	97 3/4
Erie.....	27 1/2	27 3/4
Fort Wayne.....	111	111 1/2
Harlem.....	59	59 1/2
Hannibal and St. Joseph.....	21 1/2	21 3/4
Homestead.....	34 1/2	34 3/4
Illinois Central.....	80 1/2	80 3/4
Kansas Pacific.....	57 1/2	57 3/4
Kansas and Texas.....	14 1/2	14 3/4
Lake Shore.....	75 1/2	75 3/4
Louisville and Nashville.....	61 1/2	61 3/4
Michigan Central.....	80 1/2	80 3/4
Morris and Essex.....	90 1/2	90 3/4
New Jersey Central.....	50 1/2	50 3/4

Northwest.....	69 1/2	69 3/4
Ohio and Mississippi.....	24 1/2	24 3/4
Pacific Mail.....	34	34 1/2
Panama.....	148	148 1/2
Quicksilver.....	14 1/2	14 3/4
Rock Island and Pacific.....	38 1/2	38 3/4
St. Louis and Iron Mountain.....	27 1/2	27 3/4
St. Louis Kansas City Northern.....	15 1/2	15 3/4
St. Louis and San Francisco.....	41 1/2	41 3/4
St. Paul.....	12 1/2	12 3/4
Standard.....	50 1/2	50 3/4
Sutro Tunnel.....	33 1/2	33 3/4
Union Pacific.....	44 1/2	44 3/4
Wabash.....	72 1/2	72 3/4
Western Union Telegraph.....	114 1/2	114 3/4

GENERAL HARDWARE.

The condition of trade, so far as Hardware is concerned, is unchanged since our last writing; the demand continues active for the season, and the prospects for a steady business during the summer months and an active fall trade are favorable.

In foreign Hardware there is something of a lull, although in some lines of goods, notably agricultural tools and the like, the demand is active, and on the whole the business of the season has been satisfactory. No changes in values are reported.

The Cutlery Manufacturers' Association, at a meeting held during the week, at Beaver Falls, Pa., reduced the price of Butcher Knives, but the particulars regarding the reduction have not yet been given to the trade.

The demand for Nails is fair, and so far as we can learn, the market is strong at \$2.25, net, for rod. to 60d.

Clement M. Biddle, Philadelphia, advertises on the opposite page for two first-class salesmen to solicit foreign business—one for a trip through Mexico and the West India Islands and one to travel in Australia and the East Indies. Liberal arrangements will be made with parties having business acquaintance in the countries mentioned.

The Rogers Cutlery Company, Hartford, Conn., have issued the following discount sheet:

DISCOUNTS FOR THE SEASON OF 1879.	
Goods Stamped Wm. Rogers & Son.	40 per cent., 4 months' note or approved credit.
40 per cent., 30 days.	
40 per cent., 10 days.	

Goods Stamped Rogers Cutlery Co.

40 per cent., 4 months' note or approved credit.

40 per cent., 30 days.

40 per cent., 10 days.

Rebates per Season of Six Months.

5 per cent. on \$500 sold per season.

10 per cent. on \$1000 sold per season.

15 per cent. on \$2000 sold per season.

Payable at the end of each season ending July 1 and January 1.

Solid Steel Table Knives, etc. Per doz.

Dessert Knives..... \$2.75

Medium..... 2.85

Table Fruit Knives..... 2.00

Steel Nut Pickers..... 2.75

Steel Nut Cracks..... 6.00

Discount 5 per cent., 30 days; 6 per cent., 10 days.

We make a specialty of orders etched with the name of hotels, restaurants or private dealers, and will guarantee that all goods so etched and plated by us are plated fully up to our standard.

THE WM. ROGERS MFG. CO.

THE ROGERS CUTLERY CO.

F. WILLSON ROGERS, Secretary.

Notice.—The "Windsor" pattern, "Princess," "Crown," "Newport" and "Laurel" are sold in Wm. Rogers & Son only, and are subject to the combination discounts.

All other patterns are stamped with either trade-mark, as the purchaser may wish.

We have received the following circular:

Office of Empire Edge Tool Works, A. G.

Peck & Co., proprietors, manufacturers of Axes and Edge Tools, Cohoes, N. Y.

Obliged by ill health to withdraw from the business of manufacturing Edge Tools, I have transferred my interest in the firm of M. H. Jones & Co., to my partner, Mr. A. G. Peck, who will continue the business as heretofore, with all the brands and trade-marks formerly used by us, and respectfully request a continuance of your patronage.

M. H. JONES.

COHOES, N. Y., May 1, 1879.

Having purchased the interest of my partner, M. H. Jones, I have engaged the services, as superintendent, of Mr. Albert H. McLane, who, with 25 years' experience at "Blood's" position he will now occupy, and with special care over every department, it shall be our endeavor to maintain, and, if possible, surpass the high standard of excellence our Edge Tools have acquired with the trade, and hoping to deserve the new and retain our old customers, we are, Respectfully,

A. G. PECK & CO.

We invite attention to the advertisement of Edward Frith & Son, which appears among "Special Notices," on the opposite page. They offer for sale a limited number of shares of Sanderson Bros. Steel Co.

The Philadelphia Novelty Mfg. Co. illustrate, in their advertisement on the 9th page, "The American Double Acting Horse Hay Fork," to which we invite the consideration of the trade. This is a new invention in Hay Forks, and was patented April 8, 1879.

The manufacturers claim it to be the simplest, as well as the most perfect Fork of its class in the market. In a circular they say:

"A child of ten years old can manage it perfectly, and it will carry all the hay or straw which a pair of horses can take from the wagon. It works equally well in wet, dry, long or short hay, and can be operated in the closest mow without difficulty, as the rotation of the load does not affect the tripping device, and is at all times perfectly under the control of the operator. The strain on the plunger from the weight of hay resting upon the levers when projected, is less than one-fourth what it is in the best so-called harpoon hay forks, and were it desirable could be reduced to nothing, as the compound lever pivot can be thrown outward, if desired, so as to make

the lever nothing but a cross bar upon which the hay may rest. We find it preferable, however, to give the plunger sufficient upward thrust to accomplish the ready delivery of the hay, which has been done. An inspection of the cuts will give some idea of the construction of this implement."

IRON.

American Pig.—The general accounts of this market report it dull as far as transactions are concerned, but in the matter of prices exceptionally strong. The demand for Lehigh Irons for Western account, previously noticed in these columns, still continues, and the shipments to the West are larger this season than for many years. Sales, in lots, during the week, of various brands, aggregate between 2000 and 3000 tons Nos. 1 and 2 Foundry at our quotations. We quote: Foundry No. 1, \$18 @ \$19; Foundry No. 2, \$17 @ \$18, and Gray Forge, \$16.50.

Scotch Pig.—The demand during the week has been simply of a retail nature. We quote: Eglinton, \$19.50, and Coltness, \$22.

Rails.—The only transaction we hear of is the sale of 3000 tons Steel Rails by the Lackawanna Iron and Coal Co., of Scranton, Pa., at current figures. These Rails are for fall delivery, the entire product of the mill being sold up to October next. There is also a rumored sale of a large lot of Iron Rails, but the particulars have not transpired. We quote: Steel at tide-water, \$45, and Iron at mill, \$36 @ \$37.

Old Rails.—We hear of some small lots being sold of considerable inquiry. We quote \$21.50 @ \$22 here, which is a slight advance over last week's figures. Should the strike which is threatened in Pittsburgh take place and continue for any length of time, the price of Old Rails will, in all probability, still further advance. Bar and Forge Irons already feel the effect of the probable disturbance, and we hear of an advance of \$4 per ton over present prices being asked for Puddled Bars.

Scrap.—No sales are reported, and quotations remain at \$23 @ \$24 for No. 1 Wrought from yard.

METALS.

Copper.—The Copper market has relaxed into a state of extreme dullness, as was to be foreseen, sales for the week being limited to 200,000 lbs. Lake Superior on the spot at 16 1/2¢ @ 16 3/4¢, which is also the closing price. Baltimore is worth about as much. Spot lots of Copper continue quite scarce, hence the above range of value is firmly sustained. There is nothing new from England by cable; by mail we receive the following remarks, dated May 15: "There is very little doing, prices being the same as they were last week, viz., £61 Trough and £62 Best Selected." The London Mining Journal of the 17th inst. contains the following passage: "A gloomy tone prevails over this market, which in ordinary times would be most surprising, for during a season of actual warfare between two of the chief producing countries, it is indeed most remarkable that speculators should be so inactive. However, at present the war on the West Coast of America has in no way diminished the supply, but rather, on the contrary, it appears to be on the increase, as the charters for the last fortnight have been telegraphed at 3800 tons." There is a steady demand for Manufactured Copper at the combination prices, which are unchanged. We quote: New Sheathing Copper, 22¢; Braziers', 24¢, and Bolts, 24¢. Bottoms, 26¢; American Yellow Sheathing Metal, 13 1/2¢; Yellow Metal Bolts, 20¢, and English Yellow Sheathing Metal, 12¢ @ 12 1/2¢, in bond.

Tin.—The general features have undergone no change since our last week's report. We quote Straits on the spot, large lots, 14 1/2¢ @ 14 3/4¢; Refined English, nominally, 15¢; Common do., nominally, 14 1/2¢ @ 15¢, and Banca 16 1/2¢ @ 17 1/4¢. Billiton is nominal. This quality is not liked here; none had been imported for years until recently, when speculators made a venture, and there is about 5000 slabs still unsold. The jobbing demand is but moderately active; a sale of 2500 slabs Straits was made this week at 14¢ on the spot. There have been no fresh arrivals since our last issue. The London and Singapore markets are as yet unaltered. By mail we receive the following, dated May 15: "Terms are again altered, now being 1 1/4¢ and 1¢ discounts. The market is quiet at £68 for Lamb and Flag, £69 for Refined and £67 for Straits." From the London Mining Journal of May 17 we copy the following paragraph: "This market has been exceedingly dull all through the week, and prices for foreign have receded to £66 @ £66.5 per ton. There is literally nothing to induce speculators to come forward and purchase, for there is evidently little or no confidence in the stability of the market, and as most consumers refuse to purchase beyond their immediate wants, quotations have a downward tendency, and have already fallen away to the extent of nearly £4 per ton from what they were at the latter part of March and early April." **Tin Plates.**—The recent decline here has been superseded by a recovery, and it would appear that the temporary depression at this point has been the effect of some speculative pressure, now again withdrawn. A meeting of makers is to be held in Wales early next month, as per advices by mail, when the policy of a continued reduction will come up for debate. The following are the quotations here, per box, large lines, ordinary brands: Charcoal Bright, \$6 @ \$6.25; ditto Terns, \$5.62 1/2 @ \$5.87 1/2; Coke Tin, \$5 @ \$5.12 1/2; and ditto Terns, \$5 @ \$5.12 1/2. We have received the following by mail, dated Liverpool, May 15: "During the last few days there has been much more pressure to sell, especially Coke Tin, in which line makers are getting bare of work, though prices are hardly quotably lower. We call the market all round decidedly weaker. The

shipments during the first four months from Liverpool to American ports have been 604,340 boxes, against 481,783 in 1878, 534,164 in 1877, and 465,162 in 1876. The shipments from the United Kingdom have been, in tons, 57,758, to all quarters, against 47,707 in 1878, and 48,257 in 1877: of these the United States received 44,226 tons in 1879, against 32,998 in 1878, and 32,565 in 1877."

Lead.—There is not much doing in this metal, the inquiry being light; 3 1/2¢ is offered for common domestic, small lots selling at 3.10¢. Refined is held nominally at 3.20¢ @ 3.25¢, the market closing very quiet. We receive the following from England, dated May 15: "A good deal of lead has been sold during the past week, and prices are now firmer; English Pig, £13. 17/6, and Spanish £13. 17/6." And two days later: "The imports have continued large, and much in excess of the requirements of the market, and the few transactions which have taken place have been carried through chiefly at last week's figures, though some sellers are slightly firmer in their quotations." We quote: Bar, 4 1/2¢; Pipe, 4 1/2¢; Sheet, 5 1/2¢; Tin-lined Pipe, 12¢; No. 1 Solder, 10¢, all less 10¢ to the trade.

Spelter and Zinc.—Common Domestic Spelter is quiescent, prices ranging from 4 1/2¢ to 4 3/4¢ on very small sales. We quote: Refined, 6¢ @ 6 1/2¢; Silesian, nominally 5 1/2¢ @ 5 3/4¢; and Bergensport, from Lehigh ore, 9¢. Sheet Zinc may be quoted 6 1/2¢ @ 6 3/4¢. London, May 17.—This market remains quiet, and the low prices of both English and Silesian do not induce many buyers to come forward and purchase.

Nickel.—But a moderate amount of activity is noticeable at the unchanged price of \$1.25 for prime American.

Antimony.—There is not much doing. Prices range between 11 1/2¢ and 11 3/4¢, according to quantity and brand.

COAL.

During the early part of the present week very strong efforts were made in several directions to obtain an advance in prices, or at least secure themselves against a drop at the auction sale of yesterday. There has been a good deal of talk during the past week or two in regard to an advance in prices, which was said to be inevitable upon the first of June. Advantage was also taken of the very brisk demand to predict a material advance, and, by plausible reasoning, to show that an advance could hardly be escaped, the impending strikes and the scarcity of men being used as strong arguments. On the 27th the general Coal agent of the Philadelphia and Reading Coal and Iron Company, issued the following prices for Coal at Philadelphia:

	Steam.	Boat.	B'n.	Egg.	Stove.	Chest.
Hard white ash.....	\$2.50	\$2.40	\$2.40	\$2.50	\$2.25	
Free burning white ash.....	2.50	2.40	2.40	2.50	2.25	
North Franklin white ash.....	2.20	2.30	2.30	2.50	2.25	
Shuylkill red ash.....	2.20	2.30	2.30	2.50	2.25	
Shamokin coal.....	2.40	2.50	2.50	2.25		
Lorberry coal.....	2.50	2.50	2.50	2.75	2.75	
Lykens Valley (Brookside).....	2.75	2.75	2.75	3.00	3.00	
Lump, \$2.50.						

To bring these up to New York prices the usual 35 cents per ton must be added. One or two other companies also signified their intention to increase the price upon the 1st. At the auction sale which took place yesterday, all these points were carefully explained by the auctioneer, and no doubt had their effect. It was rumored that for the judicious manner in which these facts were handled, the price would have fallen off at least 10 cents.

Below we give Mr. Seward's figures of the sale, which show that there was an actual advance in the auction prices of about 3 cents.

Prices Obtained at the Scranton Auction Sale, May 28, 1879.

5,000 Steamer.....	\$2.09	40,000 Stove.....	\$2.41
23,000 Grate.....	2.09 1/2	10,000 Chestnut.....	2.27 1/2

IMPORTS

Of Hardware, Iron, Steel and Metals into the Port of New York, for the Week ending May 27, 1879:

Hardware.	Iron.
Baldwin Bros. & Co. Mds., pkgs., 19	Baltzer & Lichtenstein. Spiegel, kilos, 153,250
Barnett J. P. Manganese, cks., 10	Bertaux C. W. Ore, tons, 308
Bloemfield J. C. & Co. Hdw., cks., 20	Brown Bros. & Co. Bars, 4450
Hdw., pkgs., 4	Degener R. & C. Bars, bds., 60
Blumenthal A. & S. Mds., pkgs., 4	Bundles, 300
Boker Hermann & Co. Hdw., cks., 57	Fuller, Dana & Fitz. Bundle, 1
Dallett, Boulton & Co. Mach'y, bxs., 7	Henderson Bros. Fig. tons, 100
Degener R. & C. Iron nails, cks., 200	Irwin R. & Co. Fig. tons, 100
Lead shot, kgs., 20	Lunberg Gustaf. Bars, 1741
Degrauw, Aymar & Co. Chains, 8	Colls, 85
Chains, cks., 5	Marvel Wm. D. Hematite ore, tons, 302
Drexel, Morgan & Co. Hdw., cks., 2	Ore, tons, 250
Folsom H. & D. Caps, cks., 13	McCoy & Co. Bundles, 1500
Graef & Nevins. Mds., pkgs., 4	Milliken & Smith. Wire rods, bds., 484
Hocht Bros. Mds., pkgs., 4	Perkins, Livingston & Co. Post, 1
Hermann H. & Co. Mds., pkgs., 18	Cast iron, tons, 150
Hopkins E. T. Mds., pkgs., 12	Prosser Thos. & Sons. Iron tubes, bds., 16
Howard, Sanger & Co. Mds., pkgs., 10	Mds., pkgs., 15
Hdw., cks., 3	Sellman J. W. & Co. Rails, 3050
Lesper, Whitman & Co. Hdw., cks., 1	Williamson J. & Co. Fig. tons, 100
Lewis Bros. & Co. Mds., pkgs., 3	Order.
Lewis & Conger. Hollowware, hds., 3	Bars, 3066
Hdw., cks., 2	Scrap, tons, 200
McCoy & Co. Mds., pkgs., 1	Sheet iron, bds., 189
Merchandise Dist. Co. Hdw., cks., 1	Sheet iron, bxs., 37
Moore's J. P. Sons. Mds., pkgs., 1	Spiegel, kilos, 456,750
Munoz A. A. Mach'y, bxs., 8	Wire rods, bds., 650
Peters Bros. Mds., pkgs., 5	Steel.
Rogers Henry. Mds., pkgs., 2	Bank of Montreal. Old spring steel, a quantity
Scovill Mfg. Co. Mds., pkgs., 6	Degener R. & C. Bars, cks., 50
Stearns John N. & Co. Mach'y, case, 1	Naylor & Co. Bundles, 20
Struller, Lau & Co. Copper caps, cks., 16	Cases, 32
Taylor Thos. Cutlery, cks., 2	Order.
Upson, Walton & Co. Wire rope coils, 2	Bars, 9
Van Nest & Co., A. R. Hdw., pkgs., 2	Bundles, 138
Wolgastner E. Co. Mds., pkgs., 4	Cases, 35
Wetzlar M. Mds., pkgs., 2	Harley & Hamlin. Brass borings, bags, 10
White John & Bro. Hdw., cks., 1	Harper & Bros. Type, cks., 4
White Alex. Hdw., case, 1	Meyer Morris. Lead, bars, 1068
Wiebusch & Hilger. Hdw., cks., 1	Naylor & Co. Tin plates, bxs., 202
Anvils, cutlery and hdw., bxs., 269	Phelps Dodge & Co. Tin plates, bxs., 1024
Wilson & James. Hdw., cks., 1	Pratt C. & Co. Tin plates, bxs., 997
Wolf R. H. & Co. Mds., cks., 66	Willert & Hamlin. Yel. met. sheathing, cks., 105
Order.	Order.
Channel coal, tons, 282	Lead, pigs, 425
Cartridges, cks., 50	Tin plates, bxs., 11-
Coal, tons, 1055	62
Crank pins, 24	Tin andterne plates, bxs., 371
Files, cks., 1	
Grindstones, 70	
Hdw., pkgs., 63	
Hoes, cks., 1	
Per. caps, case, 1	

OLD METALS, PAPER STOCK, &c.

Quotations for the Old Metal and Paper Stock market stand unchanged since our last review. There is very little activity in Old Metals. Paper Stock is rather flat. Newspapers are somewhat scarce, and an advance in price is anticipated. The demand for good imperfections is quite active.

The purchasing prices offered by dealers for Old Metals are as follows:

Copper, heavy.....	per lb. \$0.11 @	....
Copper Bottoms.....	" " " " " "	....
Yellow Metal.....	" " " " " "	....
Brass, heavy.....	" " " " " "	....
Brass, light.....	" " " " " "	....
Composition, heavy.....	" " " " " "	....
Lead, solid.....	" " " " " "	....
Tea Lead.....	" " " " " "	....
Zinc.....	" " " " " "	....
Pewter, No. 1.....	" " " " " "	....
Pewter, No. 2.....	" " " " " "	....
Wrought Iron.....	prton \$16.00 @	17.00
Light do.....	" " " " " "	....
Stove Plate.....	" " " " " "	....
Machinery do.....	" " " " " "	....
Grate Bars.....	" " " " " "	....

The prices current for Rags, &c., are as follows:

Canvas, Linen.....	per lb. 3 c. @	3 1/2 c.
White Cotton, No. 1.....	" " " " " "	....
White, No. 1.....	" " " " " "	....
Second.....	" " " " " "	....
Mixed, Woolen.....	" " " " " "	....
Soft do.....	" " " " " "	....
Mixed Rags.....	" " " " " "	....
Gunny bagging.....	" " " " " "	....
Juste butts.....	" " " " " "	....
Kentucky bagging.....	" " " " " "	....
Book Stock.....	" " " " " "	....
Newspapers.....	" " " " " "	....
Waste Paper and Scrap.....	" " " " " "	....
Kentucky Bale Rope.....	" " " " " "	....
Tarred Shaking.....	" " " " " "	....
Grass Rope.....	" " " " " "	....

Messrs. Du Plaine & Co., Philadelphia, under date of May 26, quote the market prices for Old Metals as follows:

Heavy Old Copper.....	cents @	14 1/2 @
Light Tinned Copper.....	" " " " " "	....
Copper Bottoms.....	" " " " " "	....
Locomotive Copper and Tin Bronze.....	" " " " " "	....
Heavy Red Brass Scrap.....	" " " " " "	....
Light Red Brass Scrap.....	" " " " " "	....
Heavy Yellow Brass Scrap.....	" " " " " "	....
Light Yellow Brass Scrap.....	" " " " " "	....
Old Lead Pipe.....	" " " " " "	....
Old Junk Lead (melted in mass).....	" " " " " "	....
Tea Lead.....	" " " " " "	....
New Zinc Clippings.....	" " " " " "	....
Old Scrap Zinc.....	" " " " " "	....
Old Battery Zinc.....	" " " " " "	....
Flambers' Lead Joints.....	" " " " " "	....
No. 1 Pewter.....	" " " " " "	....
No. 2 Pewter.....	" " " " " "	....
Old Type Metal.....	" " " " " "	....
Red Brass Turnings.....	" " " " " "	....
Yellow Brass Turnings.....	" " " " " "	....
Spelter Dross.....	" " " " " "	....
Lead Dross.....	" " " " " "	....
Stereotype or Electrotype Plates.....	" " " " " "	....

PHILADELPHIA.

Office of The Iron Age, 220 South Fourth St., PHILADELPHIA, May 27, 1879.

Pig Iron.—The market seems to have lost something of the buoyancy which prevailed during the past few weeks, although there is a strong undertone, and, so far as we can see, no reason to anticipate any special change in values. The demand for immediate delivery is less urgent, and, in view of the dullness usually experienced

during the summer months, there is a disposition among buyers to wait further developments. The leading furnaces are, however, pretty generally sold ahead, and a month or two of inactivity, so far as new orders are concerned, will not make much difference. There are several influences at work tending to unsettle the market, such, for instance, as the possibility of mills being shut down on account of the labor question. On the other hand, the scarcity of old rails, and the urgent demand for new rails, tends to keep the market bare of low-priced Pig Iron, with prospects of still more important influences in this direction at an early date. Good Foundry Irons are still in limited supply, although sellers are said to be offering more freely than they did some time ago. Prices for the present are not likely to show much, if any, change, although the prevalent opinion seems to be that in the meantime no further advance will be attempted. Prices remain as last quoted, with no sales of special importance. An order for 1000 tons of Forge Iron was entered last week by one of the leading furnaces at an advance of \$1.25 per ton on a similar sale made the last week in February. We quote: No. 1 Foundry, \$18.50 @ \$20; No. 2 do., \$17.50 @ \$18; Gray Forge, \$16.50 @ \$17. Sales of large lots of White and Mottled Iron reported at full prices.

Muck Bar.—The market is a little irregular, with a considerable amount of business doing in small and medium-sized lots at prices varying from \$31.50 to \$32.50 at tide.

Blooms.—The market is very quiet, and only small sales reported at former quotations, viz.: Sunken Scrap Blooms (2464 lb.), \$38 @ \$39; Northern Ore Blooms (2240 lb.), \$33 @ \$37; best quality Charcoal Billets (2240 lb.), for wire and steel purposes, \$58 @ \$60; Bars do., \$62.50 @ \$65; Sheet Iron Blooms, cornered (2464 lb.), \$53 @ \$55; Cold-blast Charcoal Plate Blooms, \$50 @ \$53; run-out Anthracite, \$45 @ \$47.50.

Structural Iron.—The market shows no change of importance. There is a good deal of inquiry and a fair amount of orders on hand, but actual sales during the week have been somewhat lighter than usual. The mills are less pushed than they were in making deliveries, and as several large contracts are nearly completed, buyers can place orders without much difficulty. The outlook is considered quite encouraging, however, and prices are firmly maintained, say: Angles, 2 1/2 @ 2 3/8; Tees, 2 3/8 @ 2 1/2; Beams and Channels, 2 5/8 @ 2 7/8, according to specification.

Plate and Tank Iron.—There is no change to note except that prices are slightly firmer than last week, although we cannot report any advance. There is a fair demand for all descriptions, with probability of several new orders being in the market in course of a few days. The Erie Railway Co. have several bridges under negotiation, and it is expected that 1000 tons will be required for this purpose immediately. While there is no special activity to report, the feeling seems to be better, and it is likely that the low prices recently current will not be accepted in new transactions. An order for 1000 tons Skelp Iron was placed last week at a slight advance, and an order for an additional 1000 tons is in the market to-day. We quote: Skelp, 1.95 @ 2; Common Plates, 2.25 @ 2.35; Tank Iron, 2.25 @ 2.45; C. No. 1, 2.45 @ 2.65; Shell Iron, 2.75 @ 2.95; Flange Iron, 3.75 @ 4; Solid Firebox, 4.85 @ 5; and Best Bloom, 5.50 @ 6.

Bar Iron.—The market is very unsettled, and although the demand is less urgent than it was some time ago, manufacturers offer the products of their mills very sparingly. The prospect of a strike in Pittsburgh may throw a good deal of business in this direction, while it is by no means certain that the mills in this vicinity will be able to keep their men at work. The improvement in general business appears, to some extent, to warrant the expectation of better remuneration for labor, as there is beyond question a genuine demand for iron, for which higher prices would be paid if sellers were unanimous in their demands. At present, however, everything is unsettled, and it is impossible to predict what will be the immediate result, although finally higher prices will no doubt be established. Prices are steady, with only small sales at 1.85 @ 2.05, according to quality.

Steel Rails.—The market is without change, the mills full of work, and meeting the demand at former prices so far as they are able to accommodate their customers. Sales are of frequent occurrence, but not in large lots, as transactions are almost purely matters of accommodation. There is little doubt that higher prices might be obtained, but sellers show no disposition to take advantage of the scarcity, which may, perhaps, be overcome in course of a few months. Sales have been made at \$42 @ \$44 at mill, at which figure we quote the market steady.

Iron Rails.—The market, which we quoted active last week, may be called excited to-day, an advance of fully \$2 per ton having been established, with more demand than can be met. Sales to a very large amount have been made, but at prices which are held confidential. We are informed that \$37 at mill has been refused for 50s to-day, although during the week that price has been accepted, delivered at tide. Orders are still in the market for many thousands tons, but at present no one appears disposed to name a price, as the raw material is almost as scarce as new Rails. It is not likely, however, that a much further advance will be made in prices, as attention would be directed to foreign markets—in fact, negotiations are now in progress in regard to several large lots. The mills in Pennsylvania, however, are all tolerably well supplied with orders, and unless prices and terms are in every respect satisfactory, there is but little chance of placing new business. We quote \$37 at mill as latest quotation.

Spikes.—Are very active, and it is difficult to meet the demand. Prices are firm and nominally as before, viz.: 5 1/2 x 9-16, 2 1/4 @; 1/4 x 4 and longer, 2 1/2 @; 7-16 x 4 and longer, 2 6/8 @; 3/8 x 3 1/2 and longer, 3 @.

Old Rails.—Are the scarcest article on the list; we are informed that sales have been made at \$22.50 and that \$23 is now bid, with none to be had at the price. This, however, is believed to be only temporary, as importations can be made at these prices and leave a very fair margin of profit. We understand that several cargoes from abroad are now afloat for this market, and it is quite likely that the extreme figure has been reached, unless a corresponding advance is made on the other side. In the meantime \$22.50 @ \$23 would be paid for spot lots of good quality, with considerable uncertainty as to prices in the immediate future.

Scrap Iron.—Continues firm, and sales during the week have all been at full prices. One or two cargoes have arrived from Europe, and sales of Wrought are reported to-day at \$24 ex ship. We quote Cast, \$14 @ \$15.50; Wrought, \$23.50 @ \$24.50.

Nails.—Are unchanged at \$2.25; market quiet and firm.

PITTSBURGH.

Office of The Iron Age, 77 Fourth Avenue, PITTSBURGH, PA., May 27, 1879.

The general iron trade continues unsettled and unsatisfactory. The pending issue between the manufacturers and puddlers, so near at hand, is being looked forward to with considerable apprehension. Rumors are abundant, and, as might be expected, they are very conflicting. It is earnestly hoped that there will be no lockout—that a satisfactory understanding will be arrived at; but unless the Ironworkers are willing to make some concessions, there appears to be no alternative, as the great majority of the mill owners have for some months past asserted, and still assert, that unless there is a reduction made in the cost of skilled labor, they will shut down, unless the price for the same kind of work should be advanced East. Pittsburgh mill owners would have no objection to continue paying current rates for labor, if they were not so much higher than those paid for the same kind of labor in the East, with which they are thrown in competition. It is claimed by puddlers that, owing to Eastern Pig Iron being so much easier worked, a puddler there can make almost as much at \$3.50 as at \$5 here. While there is some difference in the Pig Iron, it is stated by those who are in a position to know, that it is nothing like that claimed by the puddlers, and that, as the matter now stands, the situation is decidedly against Pittsburgh. The latest information that can be obtained up to the present writing, is that the Iron manufacturers are determined to shut down unless the puddlers are willing to make some concessions; hence, unless the latter agree to "come down," a lockout not only here, but throughout the West, is more than probable.

The freight war still continues between the Pittsburgh and Lake Erie (backed by Vanderbilt) on the one side, and the Pennsylvania Railroad on the other. Rates both East and West have been further reduced, and there is no assurance, by any means, that the lowest notch has yet been reached. The rates the past few days from Pittsburgh to New York and Pittsburgh to Chicago have ranged from 8¢ to 9¢ per 100. At these rates the railroads can make no money, and the probability is that there will be a conference soon and uniform rates established, although there is no probability that they will be put back to anything near where they were prior to the commencement of the war.

Pig Iron.—There has been very little change in the position of the market during the past week; business continues extremely dull; the demand is confined to supplying immediate actual wants, nor is it likely that this course will be deviated from until the issue pending between the mill owners and their skilled workmen is settled. If an amicable agreement is effected and the mills continue to run, there will no doubt be an increased demand for raw iron, as the mills, as a rule, are almost bare; while, on the other hand, if a lockout is inaugurated there will, of course, be very little wanted. Bituminous Coal Smelted Iron from Coke Ores may be quoted as follows: Foundry, \$19 @ \$21, 4 mos., for Nos. 2 and 1; Mill Red-short, \$18 @ \$19, 4 mos., for cinder mixture, and \$20 for all ore; White and Mottled, \$15 @ \$16 for Neutral, and \$17 @ \$17.50 for Red-short. Bessemer—Sale of 3000 tons reported at \$20.65, 4 mos., supposed to have been sold by a local furnace; it is still quoted at \$20 @ \$20.50, cash, deliverable on cars at furnace in the Shenango and Mahoning valleys. Anthracite Irons, \$16.50 @ \$17, 4 mos., for Neutral Mill, and \$18 @ \$19 for Red-short. Coke Irons, \$16, cash, to \$16.50, 4 mos., for Mill. There is very little doing in Charcoal grades, cheaper Irons having to a considerable extent taken their place.

Manufactured Iron.—The situation remains substantially the same as noted in our last report. Owing to the possibility, if not probability, of a lockout, our manufacturers, as a rule, are refusing to make any contract for future delivery, being anxious, as the saying is, to keep close to shore, until the labor question has been settled. With less inclination to sell and an increased inquiry, as buyers realize that, in the event of a lockout, prices are most likely to advance, the market is decidedly firmer, and purchases cannot be made, even for present delivery, at the bottom rates of a month or so ago. If the Ironworkers conclude to submit to a reduction, the mills will no doubt continue to run all summer, saving a few weeks required for repairs and taking stock, as the remarkably low rail freights with which Pittsburgh is now favored will enable her to enter markets from which she has heretofore been excluded by railroad discrimination. We continue to quote prices on a basis of 1.70¢ @ 1.75¢, 60 days, for Bars—that is, for assorted orders; no one would care to sell a straight lot of Bars at quotations.

Nails.—As noted in our last, there is an increased inquiry, and with light stocks a very limited production, and possibility of a general shut-down throughout the West. The market is strong, and purchases here, even in small lots, cannot be made at the rates current a few weeks ago. The trade to the manufacturer, has been more unsatisfactory

thus far this year than at any time since the panic, as prices current, until quite recently, did not cover actual cost of the iron, the maker losing the cost of cutting, packing, keg, and other expenses; hence, it is not strange that the tendency is upward. Buyers begin to realize the situation, and are disposed to anticipate future wants, while manufacturers, in anticipation of an early advance, are selling only to regular customers, and then in small lots. We continue to quote at \$2, 60 days, with 2¢ cent. off for cash. At Wheeling the card remains unchanged on a \$1.90 basis, but there, as here, makers are refusing to contract for forward deliveries.

Horse and Mule Shoes.—There is a fair business, but no change in prices; 100-keg lots \$3.25 and \$4.25 per keg—larger lots special rates.

Railroad Spikes.—There is no abatement in the demand, all the factories being well supplied with orders, and prices are firm, but unchanged, at 2 1/4¢ @ 2 1/2¢ lb. Indeed there appears to be an active demand for all kinds of railroad supplies, and manufacturers of these are nearly all busy, some of them being unable to catch up with their orders.

Wrought Iron Pipe.—The discount on Steam and Gas Pipe has been reduced to 65 per cent., which is an advance, and from all that we can learn the advance is well sustained. Boiler Tubes are still quoted at 4 1/2¢ to 50¢ off. Oil Well Casing, 65 to 70, net, and ditto Tubing, 17 to 20. The demand for the latter, owing to the depression in the oil business, continues very light, and whenever it can be done, second-hand Casing and Tubing are being used as a matter of economy.

Steel.—There is no falling off in the demand for any of the leading grades or specialties; manufacturers are busy, and the indications are that this will continue to be the case all summer. The consumption of American Steel is steadily increasing every year, hence, notwithstanding the increased capacity, there is a demand for the entire product. Prices firm, but unchanged; Tool Steel, 10 1/2¢ @ 12¢, according to quality; Machinery, 5¢ @ 7¢; Spring, 5¢ @ 6¢; Boiler Plates, 6¢ @ 7 1/2¢.

Rails.—There have been no sales of Steel Rails here recently; not that there was no demand, but because the mill (Edgar Thomson) has orders booked sufficient to absorb its entire production until October. Quotations may be given at \$44 @ \$45, cash, delivery free on cars in Pittsburgh. Old Steel Rails are still quoted at \$25 @ \$26. Old Iron Rails in light supply and steady, for immediate delivery, at prices ranging from \$21.50 @ \$22.50, according to quality; we can report a sale of 400 tons at \$21.50.

Scrap.—The market continues moderately active, with no recent changes in prices: Old Car Wheels, \$19 @ \$20, gross; Cast Borings, \$10.50 @ \$11; Car Metal, \$14 @ \$15; No. 1 Wrought Scrap, \$22 @ \$22.50, net; Wrought Turnings, \$14 @ \$15; Car Springs, \$30 @ \$31; Car Axles, \$27 @ \$28.

Coke.—There is no apparent falling off in the demand, which is still sufficient to absorb the product of the Connellsville region, estimated at 30,000 tons per week, and orders are coming forward from nearly every part of the country accessible by water or rail. Prices continue firm and tendency upward, although it is feared that the enhanced cost will tend to decrease the consumption sooner or later. Pig Iron furnacemen have been complaining for some time past of the increased cost of Coke, and some of those west of here threaten to build ovens and make their own Coke, while others say they will go back to using Coal again. We now quote at \$1.20 @ \$1.30 per ton, deliverable free on cars at ovens.

Coal.—Business in this important article continues at a standstill, owing to the continued suspension of navigation, and until there is a rise in the river no improvement can be expected.

Window Glass.—The demand keeps up well; our manufacturers are all pretty well supplied with orders, and the indications are encouraging for a good summer trade. Another encouraging sign of the times is that there appears to be an absence, in the West, of any disposition to cut rates, although of course there is no necessity for it, as those factories in operation have about all they can do, and the prices have not advanced enough to make it an inducement to start up idle works. Stocks in first hands here are not large. We continue to quote discounts at 75 and 5 per cent. for car-load lots, and from this rate there is no deviation.

Petroleum.—There has been no material change in the situation during the past week; business continues backward for the season, and prices no better. The production continues very large, estimated at from 45,000 to 50,000 barrels per day, and the visible supply, which is larger than ever before in the history of the trade, is still accumulating. The measure pending in the Legislature proposing to tax every new well has not yet been disposed of, but the indications are that it will be defeated.

CHATTANOOGA.

Office of The Iron Age, Market and 8th Sts., CHATTANOOGA, May 26, 1879.

Business has been dull during the week; orders are not pressing; manufacturers are doing a quiet business. There has been a decided improvement in the demand for Iron Rails, both light and heavy, with considerable orders ahead. The weather has been hot and dry, the maximum temperature averaging about 86 degrees.

Pig Iron.—Business is dull, with slight weakening in prices, but not enough to justify a change of figures. Coke Irons—No. 1 Foundry, \$17.50 @ \$18.50; No. 2, \$16 @ \$17; Gray Forge, \$14 @ \$15; White and Mottled \$12 @ \$13. Hot-Blast Charcoal—No. 1 Foundry, extra, \$20 @ \$21; ditto, \$18 @ \$20; No. 2 Foundry, \$16 @ \$18; Gray Forge, \$16 @ \$18; White and Mottled, \$15. Cold Blast Charcoal—Car Wheel Metal, \$22.50 @ \$27.50; do., Extra Standard, \$24 @ \$29.50; Forge, \$17 @ \$22.

Muck Bar.—\$27 @ \$34; Old Rails, \$18 @ \$18.50; Old Car Wheels, \$18; Wrought Scrap, \$17 @ \$19.

Ores.—Brown Hematite, 50 to 56¢; per ton, \$1.75 @ \$2.25. Red Fossiliferous, 50 @ 56¢; per ton, \$1.20 @ \$1.60. The above prices for ores delivered in Chattanooga on cars, or on the wharf from flat boats.

Nails.—The demand continues quite up to the ability of the mills to meet. We continue to quote at \$2.25 rates, usual discount on job lots.

Manufactured Iron.—Demand generally light. We quote: Bars, 2¢; Railroad Spikes, 2.50¢; Light Rail, 2.25¢; Track Bolts, 3¢; Trestle Bolts, 4¢.

Coke.—We quote 11¢ @ 15¢ per bushel for washed foundry. Furnace, full supply at \$2 per ton, free on cars at Chattanooga or South Pittsburgh.

Coal.—There is no change in the market nor in prices. We quote run of mine, free on cars in Chattanooga, at \$1.25 @ \$1.75 per ton. Lump, as per quality, 10¢ @ 12¢ per bushel.

Pig Lead.—4¢; Ingot Copper, 18¢.

Iron Rails.—We quote at \$35 per ton.

CLEVELAND.

CLEVELAND, May 27, 1879.

Iron Ore.—The trade in Iron Ore continues to be encouraging. The offerings for summer delivery are much less than they have been. Consumers are looking about more eagerly. Sales are made with greater promptness and less "dickering" tendency than heretofore for years. Prices are firm and unbroken in spite of the low Lake freights offered for carrying Ore.

Pig Iron.—The market for all kinds of Pig Iron is good. The demand is better than the first of May, and prices are firmer. Bessemer Iron is particularly active, and the demand is large. Prices are firm, and in some cases higher. Charcoal Pig Iron is in good demand for all grades, particularly Car-Wheel Iron. Prices for this have a strong advancing tendency.

Bar Iron and Nails.—The latter are better, but Bars of all kinds are weak. Competition is strong.

BOSTON.

MAY 23.—The market for Pig Iron continues to be characterized by an active movement and a strong upward tendency. The prices from the Boston stores and wharves for small lots continue firm at \$21 @ \$23 for No. 1, and \$19.50 @ \$20.50 for No. 2. **Manufactured Iron.**—Bar continues firm and in fair demand, from the stores at 2¢ per lb. for Refined and 1 1/2¢ for Common. The local mills are generally running full, and have sufficient orders booked to keep them fully employed up to the usual date of summer repairs. Nails are selling at \$2.25 per keg. Sheet Iron, though in light demand, as usual at this season of the year, is firm at 2 1/4¢ @ 3¢ for single Common and 3¢ @ 3 1/2¢ for double do.; 3 1/2¢ @ 4¢ for Refined; 6 1/4¢ @ 6 1/2¢ for Galvanized, Nos. 18 to 20; 6 1/4¢ @ 8 1/2¢ for do., Nos. 21 to 28; 11 1/4¢ @ 12¢ for Russia, perfect, and 1/2¢ less for do. No. 1 stained. Plate Iron is in good request at \$2.30 for Tank, \$2.50 for C. No. 1, \$2.75 for Shell, \$3.75 for Flange. These prices are from the mills. Small lots from the stores readily command an advance of 25¢ @ 50¢ above these figures. We quote American Tool Steel at 12 1/2¢ @ 13 1/2¢; English do. at 14 1/4¢ @ 15 1/4¢; American Spring Steel at 5¢ @ 6¢; English do. at 7¢ @ 7 1/2¢; Tire Steel at 3 1/2¢ @ 4¢; Bessemer Machinery at 4¢ @ 5 1/2¢, and Cast do. at 5¢ @ 6¢. Copper continues quiet, but with holders very firm at 16 1/4¢ @ 16 1/2

British Iron and Steel Institute.

ANNUAL MEETING.

The annual meeting of the British Iron and Steel Institute at London was opened, after the transaction of some formal business, by an address from the President-elect, Mr. Williams, from which we take the following:

THE PRESIDENT'S ADDRESS.

For the production of steel the world is indebted mainly to Mr. Bessemer, and in no small degree to our distinguished ex-president, Dr. Siemens, and to both of whom Mr. Mushet's ingenious and most opportune invention is essential.

For both wrought iron and steel the starting-point must be pig iron, which so far has not been produced at moderate cost except by means of the blast furnace. During the 20 years I am speaking of there was not much alteration or improvement in this branch of the manufacture. It is perhaps not wrong to hold that our best blast furnace plant and appliances are unlikely to be much improved. A greater volume of blast and more security for regular charging and working would probably be in most cases beneficial; but in the important item of fuel consumption, it is doubtful whether any large economy will be found practicable. The other raw materials are already utilized to the fullest extent, and in the item of labor there seems no great margin for economy. The waste gases of the furnace, which at present heat the blast and raise the necessary steam, are, no doubt, capable of doing more duty as fuel; but in works consisting of blast furnaces only, it is not easy to see how this can be availed of. Where, in addition to blast furnaces, there are wrought iron and steel works close at hand—a combination likely to become more prevalent—the more complete utilization of the gases will no doubt be taken advantage of.

We many of us remember how we were started when, in 1856, at the Cheltenham meeting of the British Association, Mr. Bessemer published his invention in detail. There was, among the prominent ironmasters of the time, pretty general doubt as to some of the principles he promulgated. In less than a week from the reading of the paper, trial was made at Dowlais of the system of blowing air through pig iron, with complete success. What in outward form was pig iron, and only differed from it by having been blown through for a few minutes in the most haphazard way, was heated in a mill furnace of the common sort and rolled into bars, to the great astonishment of all concerned. In fact, an experiment undertaken to show that Mr. Bessemer had fallen into mistake proved the exact contrary. Shortly afterward the system was set to work on a larger scale, but only very rarely was the success of the first experiment equaled, and generally there was so much irregularity and failure that, notwithstanding the expenditure of a considerable sum of money, the operations were abandoned as unsuccessful. When Mr. Bessemer left Dowlais, where he had been for some time, those who had worked with him believed that even he feared that the ingenious process he had advocated was not likely to prosper. But if so, his faith soon returned; the clumsy converters first designed gave way to the beautiful tipping vessels; his works at Sheffield were started, and we owe it to his indomitable courage and perseverance that the world did not miss a great advantage. In 1860 Mr. Ramsbottom was prevailed upon to try steel rails on the London and Northwestern Railway. In 1869 Mr. Bessemer had succeeded completely. Those who studied the matter perceived that for rails, at least, his process must entirely supersede the old iron-making.

So late as 1875 our then president, Mr. Menelaus, gave in his address the chief place to puddling, and ironmasters generally looked anxiously for machinery to supersede hand labor. Now the case is very different. Puddling has been improved but little. The revolving furnace, upon which several years of skill and labor had been unsuccessfully expended in this country, was reported to have succeeded in America, and was from thence brought here in its most approved form. It must, however, be admitted that, notwithstanding very full trial, our hopes have been disappointed, and only very moderate advantage has accrued from the several machines introduced to lighten the work of the puddler. In 1869 the make of Bessemer ingots in this kingdom was barely 200,000 tons; last year it was over 800,000 tons, the American make being nearly as much, and on the Continent of Europe it is very large and growing. The total make probably exceeded two millions of tons, with the prospect of enormous increase.

The open-hearth system—initiated, in this country at least, and so ably developed by our late president, Dr. Siemens, whose regenerative furnace is of the utmost value—has also extended considerably. The make of ingots in 1878 was 178,000 tons in this country, with about as much abroad; in all, 350,000 tons. For the very high classes of steel, where absolute soundness and great ductility are the first considerations, the open-hearth system is no doubt very efficient. The time necessary for the process allows of frequent testing, and there can be given to the metal exactly the composition desired. The Siemens-Martin process is much availed of for converting old iron rails into steel, or, more correctly speaking, into ingot rails.

It is inevitable that new rails made from old iron ones should be high in phosphorus, but to compensate for this they have little carbon and silicon, and in actual work they are said to stand well. On the table is a piece of the first Bessemer rail ever rolled. It was made at Dowlais, in 1858, from an ingot supplied by Mr. Bessemer, which, by the way, was parallel. A full analysis by Mr. Stead, of Middlesbrough, is attached to the sample, which has, as will be seen, 0.446 of phosphorus—a quantity that would frighten us in these days; but carbon and silicon are almost absent. The ingots of which that just mentioned was one, were rough and of most unpromising appearance generally, but they rolled perfectly. A second

lot of ingots, received shortly afterward, though similar in appearance, rolled very badly, only three or four of them holding together so as to make rails of any sort. The reason of the difference, I am informed, was that the first came from a vessel lined with Stourbridge brick, and the second from the same vessel with an improved lining of ganister, which, though much more enduring, no doubt had the effect of preventing any elimination of phosphorus.

There has been much objection to the taking of fluid cast iron direct from the blast furnace to the Bessemer converter. An opinion obtains in some quarters that the direct process is less under control, and the resulting steel may therefore be less uniform than by the old mode of mixing several brands of iron and remelting in the cupola. Closer inquiry will show that this opinion is erroneous, and that remelting is less reliable than working direct.

In the large way the only guide the practical man has is eye-judgment. Samples can be, and in all properly managed establishments are, frequently analyzed; but I need not say that it is impossible to examine chemically more than an infinitesimal proportion of the pig iron used, the bulk of which can have nothing in the way of examination beyond the careful inspection by sight of an experienced pig-sorter. In old times, when nothing more than this inspection was obtainable, it was a good additional safeguard to mix together half a dozen reputable brands of pig iron that were very unlikely to be all wrong in the same chemical direction, and probably differed, when they differed at all, in ways that corrected each other; but the accurate knowledge of skilled furnace managers, advised by chemists whose everyday business it is to specify the proper mixtures for the blast furnace and keep out unsuitable materials, is far more certain. Given the proper ingredients, the blast furnace cannot make bad iron unless its mechanical working be disturbed by neglect or accident, which those accustomed to furnaces would find out quickly. Indeed, before the evil can have gone far the blast furnace itself and the converter may be depended upon to make prompt protest and compel the necessary attention. My conviction is that, setting aside all question of cost, and considering only uniformity of quality, there is danger in remelting, and security, without any disadvantage otherwise, in the direct process.

I cannot forbear to mention specially the important improvement, patented and already brought to some practical success by Messrs. Thomas & Gilchrist, for the dephosphorization of ordinary pig iron, thereby fitting it for use in the manufacture of steel. The essence of the improvement is the substitution of a basic lining for the ordinary ganister lining of the Bessemer converter. The idea is not now brought forward for the first time. On the contrary, the principle has long been known and availed of in the old process of puddling. In 1874 Mr. Snodgrass patented the use of basic linings for furnaces and Bessemer converters, and I have no doubt it is in the recollection of many of you that more than one eminent metallurgist at home and abroad has also recommended the change. Those who tried it, however, one and all, encountered difficulties of a practical kind which stopped them. These difficulties, it is believed, have now been overcome. With priority of invention and the rights of patentees our Institute does not interfere, and it is, I hope, needless for me to say that I do not desire to convey any opinion respecting them.

Early last year, at the works of the Blaenavon Iron Company, Monmouthshire, experiments were made by Messrs. Thomas & Gilchrist, with the aid of Mr. Martin, the linings being silicate of soda and limestone, which, however, proved unsuccessful because unenduring. A larger trial at Dowlais shortly afterward had the same result, though in all cases the phosphorus was eliminated, the difficulty being to maintain the lining, which was rammed into its place in the ordinary way. To meet this difficulty bricks of ground magnesian limestone, burned to great hardness, were made at Blaenavon, and proved by actual experiment to be efficient; but unexpected circumstances connected with the company's affairs stopped the proceedings.

Messrs. Bolckow, Vaughan & Company, of Middlesbrough, with their usual enterprise, undertook further experiments in a large way and seem to have succeeded. Knowing, as you all do, that only a small percentage of the pig iron in the world is suitable for making steel by means either of the Bessemer or the Siemens-Martin process, I will not weary you by enlarging upon the enormous advantage of an improvement that promises to make available almost all kinds of pig iron. In the paper about to be read by Messrs. Thomas & Gilchrist, we shall no doubt have much information for which iron and steel makers generally are unusually anxious, and I venture to hope that Mr. Richards will favor us with the facts as a question of practical working. [These papers were printed in our last issue.]

At some recent experiments, to which Messrs. Bolckow, Vaughan & Company were good enough to invite the leading members of the local iron trade, the blowing was in every way successful, and the quality of steel produced excellent. The samples examined, several of which were made in our presence, varied in temper from the mildest and softest to the ordinary hardness for rails, any particular sort being produced at will. Samples to test were very easily taken, and it seemed that the exact temper of metal desired could be produced with certainty.

The converter, lined with radial bricks of magnesian limestone, is said to stand well, and the necessary addition of cold basic material to the charge and during the blow, though of course it lowered the temperature at first, did not make a difficulty.

As yet there cannot have been any accurate ascertainment of waste, cost of lining, &c., but these are unlikely to be seriously against the new method. One of the large vessels at Eston, lined with basic bricks, has been set to work, and it is believed that before long the cheap pig iron of Cleveland, without admixture other than that of spiegel, which is common to all, will be extensively used for making steel.

By the changes of the last few years the relative circumstances of the iron and steel producing districts of this country and of Great Britain in relation to other countries, have been materially altered.

Before Mr. Bessemer's invention almost everything depended upon the cheapness of fuel and labor, the differing costs of ironstone, though important, being less vital. To make one ton of finished iron, taking rails and other kinds together, required, on the average, about six tons of coal, and the manual labor of many skilled men. For steel much of this is unnecessary; the consumption of coal per ton of finished steel is already less than three tons, and likely to diminish. When it is borne in mind that under the old system about one third of all the coal raised in the realm was used at iron and steel works, and that the present total get is close upon 140,000,000 tons per annum, it will be seen how large a national gain this economy of fuel is. In the item of labor the improvement is still more striking; more than half the money cost of it is saved already, while the very hard work is in a great measure dispensed with, as is also the need of long special training, without which the old iron-making processes could not be carried on. If cheap and good steel had to be recommended nothing more than the already great diminution, and, as I believe, the coming abolition of puddling, it would deserve our gratitude.

The discovery of puddling is one of the bright events of modern times. But for it there would not have been a very large output of wrought iron, without which we should not have had many of the improvements of late years that have tended so greatly to the advance of civilization. But great as our obligation to puddling is, we part with it without regret, seeing that easier and more efficient means of achieving not only the same result, but a much better, have been devised. I need not say that there is yet a large amount of hand-puddling which probably will continue for a long time. It will, I believe, steadily abate in amount, and I cannot doubt, though I say it with reluctance, knowing that the opinion is a little unpalatable to some excellent members of our Institute, that the day is at hand when, either by the Bessemer converter, or by the open-hearth, or by some other steel-making apparatus, there will be produced, with absolute certainty, with comparatively light labor, and I hope with fair profit to all concerned, every kind, variation and quality of the metal iron which we now rudely designate steel and wrought iron.

It is interesting to remember how the old puddling furnace at its establishment resembled the Bessemer converter, and how it was improved in a way closely analogous to the change now in course of being worked out by Messrs. Bolckow, Vaughan & Co., upon the system of Messrs. Thomas & Gilchrist. As is well known, Cort's furnace had a sand bottom, and the quality of the iron from it was never certain—inferior always to the iron of the old process, viz., that of working in a bath of fluid oxide, which, though very wasteful, produced iron of excellent quality, and therefore lived on in great part despite the new invention and its economies. For the Cort process excellent pig iron was made in cold blast furnaces from the best ores of the kingdom. The pig was refined in the old-fashioned refinery fires at great cost, and afterward puddled on the sand bottom. The resulting wrought iron rolled badly, owing probably to the non-elimination of phosphorus, and could only be made into merchant bars of fair quality by repeated working in the mills that involved heavy cost. A man of great ability, long since passed away—Samuel Baldwyn Rogers—proposed a cast-iron bottom for the puddling furnace instead of sand; and the suggestion brought not only the usual unbelief, but ridicule as well.

After a time the first puddling furnace with an iron bottom was erected at Merthyr Tydvil, more than half a century ago, and so succeeded that it was adopted promptly. It was soon ascertained that puddled bars, instead of being, as formerly, unworkable stuff that would hardly hold together, rolled quite easily, and that a great deal of the costly mill working might be dispensed with. Gradually cheaper iron ores came into use, and there was less refining. Before many years, in most districts of the country, refineries were dispensed with, and pig iron was puddled direct. The enormous heaps of discarded refinery and forge cinders, very good for many purposes as well as rich in iron, were worked up; and generally out of the invention of old Rogers came the greatest advantage to the manufacture of iron between the day of Cort and Bessemer. For all this Rogers got little or no reward, except local celebrity of small worth, and a nickname; and twenty years or so ago he was, by the timely intervention of a few friends, rescued from the indignity of a parish funeral. Puddling in the Rogers furnace is puddling upon oxide of iron, and the change now being brought about in the Bessemer converter is in principle the same, namely, the substitution of a basic lining for a silicious one. Much the same took place in the case of the revolving puddling furnace. For several years the great practical difficulty was the lining. After trying almost everything likely to suit, it was found that sand only would endure for even a moderate time the action and wear of the operation, and from the sand-lined vessel the puddled iron was wretchedly bad. Mr. Danks hit upon a mode of lining with iron ore, which he preserved from destruction by charging oxide of iron with the heat; subsequently there was a further improvement in the same direction by the use of fluid tap-fettling run into a water-cased vessel, upon which it formed a lining. In both cases the improvement to the puddled iron was very great, owing to the removal of phosphorus; and but for the question of cost, and perhaps more than even that, the advent of ingot iron, the revolving puddling vessel would have done good service.

It is not to the credit of practical iron-makers that they so long failed to see, and indeed did not see until an amateur pressed it upon them, that the non-elimination of phosphorus by the Bessemer and Siemens-Martin processes was for the same reason that Cort's furnace and the early revolving

furnaces did not remove it, namely, the sand linings and bottoms.

It is often said—sometimes upon seemingly good authority—that in the manufacture of iron and steel this country is losing ground, and that there is danger of our being excelled by our energetic brethren across the Atlantic, as well as by our more scientifically educated neighbors on the Continent of Europe.

Without the least desire to help any particular view of the case, I have, by visiting Continental works, and by study of the available descriptions of the American works, which I hope to see some day, endeavored to ascertain how far this opinion is well founded. While I do not doubt that to maintain our leading position, and to acquire ourselves properly in the exact manufacture that has happily taken the place of the old finger-and-thumb business, we must by every means in our power add to and make general our knowledge of the composition and character of the materials we deal with, I do not think there is much ground for alarm.

In the manufacture of ingots there is much loss and needless cost by reason of the rough system of teeming. The only guide the workman has is a chalk mark which can scarcely be worked to, and the over-varying internal capacity of the molds makes anything like accuracy impossible. The effect of this is that ingots are always cast too heavy, and crop ends are made instead of finished steel. There cannot be any insuperable difficulty in the way of showing by an indicator the exact quantity of steel teemed, and so enabling a skilled workman to run ingots of any desired weight. If this can be done, not only will there be considerable economy, but some of the unimproved iron-making mills will be available to roll steel in the old pull-over fashion, which has some advantages peculiarly its own.

For heating, the regenerative gas furnace is a great improvement; but it is believed, and I think Mr. Bell holds the opinion, that the waste gases from the blast furnace are capable of developing more heat by their proper combustion than is necessary for all the steam-getting and heating after fluid pig iron, and that except the coke put in at the tunnel head of the blast furnace there should be no expenditure of fuel.

It is, I suppose, the fact that ingot as it comes from the pit has more heat than is necessary for the rolling processes, the chilled outside being a shell holding a yoke of more or less liquid steel. Putting such ingots into an ordinary balling furnace is not therefore to heat them more, but to equalize the heat of the several parts. It would seem that for such equalization in a proper chamber for a very small expenditure of fuel, if any, is necessary; and if I am right, we may in this part of the manufacture expect a further important economy of coal.

There is, I think, great need of improved rolling machinery. We adhere too much to old types and systems, that were suitable enough for short lengths and light weights of a soft material, but which do not efficiently deal with hard ingots that are heavy and unhandy. Mere strengthening of engines and roll trains of the antique sort will not, I am convinced, do, even with the addition of the reversing engine, which is beyond question a great advantage for rolling long bars, though less suitable for short things like blooms and plates. Either by roll before roll or by some entirely new system of shaping the steel, there will probably be before long a change for the better.

There is, I think, a great future for iron and steel, not only in the few branches of the manufacture I have referred to, but in each and all of them, notably, I believe, in the employment of blown metal for castings, that with no great additional cost cannot fail to be greatly superior in strength to any made from untreated pig iron, however good; and it will be strange if, in the state of general education that is coming, men like Cort and Rogers, Neilson and Vaughan, Bessemer and Siemens, Bell and Menelaus, and other able men at home and abroad, who have made the art of iron and steel making what it is, do not arise in greater number to lead, improve and strengthen it.

A third paper on lining the Bessemer converter with lime, which we insert here as a continuation of those given in the last issue of *The Iron Age*, was that read by Mr. Edward Riley.

ON A READY MEANS OF MOLDING LIME, AND MAKING LIME OR BASIC BRICKS AND LININGS FOR FURNACES, CONVERTERS, ETC.

Several methods have been suggested and used for the manufacture of basic or lime bricks for the lining of Bessemer converters and cupolas, and various attempts have been made to line the same by ramming either with lime or limestone. One difficulty and objection in using limestone, either for the manufacture of bricks or for ramming, is the very large loss in weight and bulk the material must sustain from the expulsion of the carbonic acid and a little water, the percentage varying from 40 to 45 per cent, in weight, and the shrinkage in bulk being at least from 25 to 35 per cent. The use of quicklime is impracticable, as it is too dry and pulverulent in its character, and it is impossible to mix it with water on account of the chemical action of the water on the lime. It occurred to the author that if some cheap liquid could be used that had no chemical action on the lime, it would be possible to mold the lime either by ramming or by pressing it into molds. Various liquids were tried, such as crude petroleum oil, coal oil and rosin oil. All these answered very well. Experiments were first made on a small scale by mixing ordinary lime with from 5 to 10 per cent. of crude petroleum oil, and compressing it by hammering in a small steel cylinder with a piston of about 1½ inches in diameter; it was found that the cylinders of lime after compression might be at once placed in an ordinary fire, the petroleum burned quietly off and left a solid cylinder of lime. If burned at a low to bright red heat, no contraction takes place at all. If, however, the cylinders are burned at a high temperature, they contract to a small extent.

Many hundreds of experiments have been made with different kinds of lime, and no difficulty has been experienced in making perfectly solid cylinders; the only precau-

tion necessary is to see that the lime is well burned, and that it has not been exposed too long to a damp atmosphere. Lime that has been exposed for ten days or a fortnight to a damp atmosphere would not give satisfactory results.

Various mixtures of burned clay and oxide of iron and other substances have been made with the lime. From 5 to 7½ per cent. of burned clay makes it much harder after burning. An admixture of 3 to 5 per cent. of oxide of iron in the form of blue-billy also consolidates the lime; at the same time the shrinkage is increased. The above proportions were used with a nearly pure lime.

My experiments on a small scale being so satisfactory, I at once commenced to make ordinary bricks, using a Bodmer's hand hydraulic brick press, placed at my disposal by Mr. Bodmer. This answered admirably. On submitting the lime to a pressure of about one ton per square inch, most perfect bricks were made, and from 12 to 14 could be readily molded and forced out of the mold in an hour in the hand press; the bricks could be easily handled, and would bear shaking if taken hold of at one end. The lime used was made from Huddleston stone.

	Huddleston stone.	Kiverton Park.
Silica.....	45	3.99
Peroxyd. of iron.....	47	1.65
Alumina.....	30.82	39.12
Lime.....	21.37	90.06
Magnesia.....	46.73	43.60
Carbonic acid.....	20	48
Moisture.....	12	17
Phosphoric acid.....	1	0.01
Total.....	100.24	100.35

In burning the bricks, as far as my experience has gone, it is better to use a moderately quick fire, instead of a slow, gradual fire. Some practical experiments have been made with a rammed lining at the works of Messrs. Brown, Bayley & Dixon. A small experimental converter about 20 inches wide and 20 inches deep, exclusive of top part, was rammed up with the ordinary magnesian lime used in Sheffield. The lime was ground in a mortar mill with from 10 to 15 per cent. of crude petroleum oil.

The vessel was first fired with a slow fire, which had the effect of making the upper overhanging part of the converter crumbly, and ultimately caused it to fall. After repairing this damage, the fire was relighted, a gentle blast was put on, and rapidly increased to a full blast. A little roll scale was thrown into the converter, and it was found that a good hard glazed surface was formed after blowing some hours with coke.

From one to two cwt. of Ferry Hill pig iron was run into this converter, first adding some iron scale and lime. After blowing a minute or two a few pounds of a mixture of iron scale and lime were added. It was found, however, that this chilled the metal, and after blowing for rather less than ten minutes, it was thought desirable to run it out. A second charge was then run in and blown about ten minutes, but, from the small size of the converter and the fear of the metal setting, it was found necessary to run it out again before complete blowing.

The following is the analysis of the pig used and the cinder formed:

The Pig contained:	
Silicium, per cent.....	1.92
Phosphorus, per cent.....	1.84
In Metal from ad blow:	
Carbon, per cent.....	.459
Phosphorus, per cent.....	.874
Cinder, No. 1.	
Silica, per cent.....	13.10
Phos. acid, per cent.....	6.99
Cinder, No. 2.	
Silica, per cent.....	24.00
Phos. acid, per cent.....	10.44

The metal from the first blow was so much mixed with cinder and sand that it was difficult to get a fair sample.

It will be seen that in less than ten minutes 50 per cent. of the phosphorus was taken out of the metal.

In the small converter the head was movable, and the lower portion was first burnt with the coke. It was found that the lining expanded, and rose up above the edge of the plates. Some of the metal remained in the converter on account of its becoming chilled. The lining was very solid and hard, and could only be detached from the converter by driving in a chisel with a hammer.

I have succeeded in making and burning several ordinary Bessemer tuyeres for an 8-ton converter as nearly as possible perfect, by simply ramming the lime in the molds.

I find that bricks and cylinders made from ordinary Sheffield lime may, when burned at a high temperature, be steeped in water without slaking.

The following is the composition of the bricks after burning:

Silica.....	8.85
Lime.....	51.80
Magnesia.....	35.35
Alumina.....	2.60
Peroxyd. of iron.....	1.48
Sulphide of calcium.....	.55
Total.....	100.55

I hope, by the assistance of one of the Bodmer hydraulic brick presses, to turn out from 6 to 12 bricks per minute mathematically true. These, I believe, can be at once used to line up a converter or other furnace. The bricks, being perfectly true and square, can be built in almost without mortar or material for the joints; and I see no reason why ordinary converters should not be lined in 24 hours, and burnt and glazed in another 24 to 48 hours. Either the lining of the converter with the bricks or by ramming, seems to me the most ready and economical means of obtaining a lime or basic lining.

(To be continued.)

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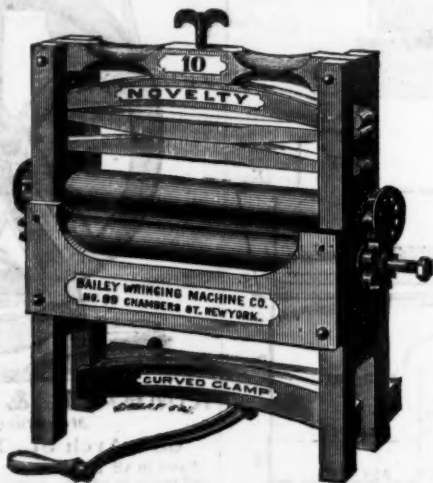
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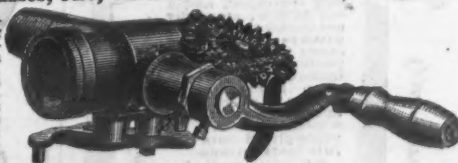
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Wide Bar Full Length.

Patent Screw Wrenches

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MARCH 23, 1869,
REISSUED 1870.

NOVEMBER 10, 1863,
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15 inch, 10 1/2 inch Driving Wheels, 6 1/2 inch Cylinder, Man Size, 43 lbs.	\$22.00
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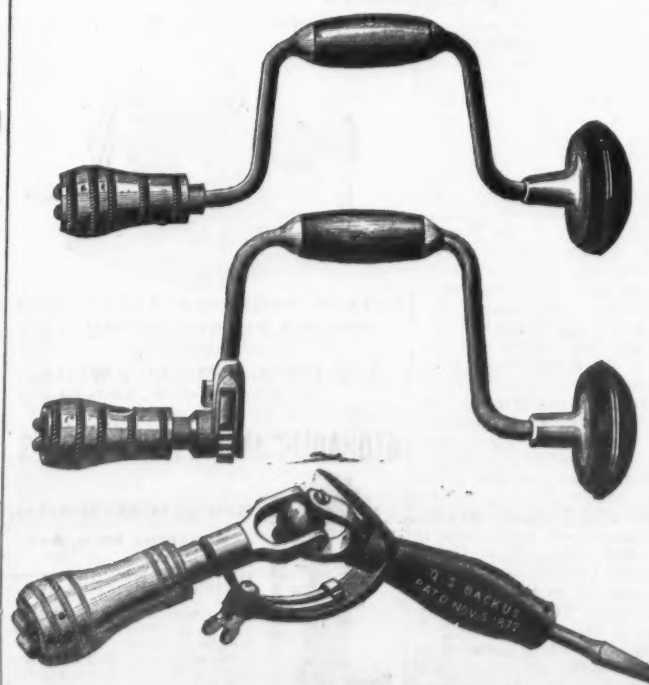
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Reviving Prosperity of Trade and Manufacture.

The New York Times, in a recent issue, publishes an interesting review of the condition of trade and the manufacturing industries in nearly all the important centers of the United States. The reports are from about 75 different points in 31 States, and indicate a returning prosperity in all branches of trade and manufacture. We give below an abstract, including such portions as may interest our readers:

In New England, manufacturers of all kinds appear to have felt the revival of business most strongly. Except in one or two cases in Rhode Island and Connecticut, where recent financial embarrassments temporarily interfere, factories are running on full time, with a brisk demand for their products.

RHODE ISLAND.

The Providence Tool Company are engaged, with a large force of workmen, in finishing a heavy contract for arms—600,000—for the Turkish government. It will take not less than six months to finish the contract. The Corliss Engine Company, the Rhode Island Locomotive Works, the nail factories, foundries and machine shops in various parts of the State, are as busy as they can be. Many of the largest factories in

CONNECTICUT

are employing more men than for several years, and some are running overtime. Wooden shipbuilding at the once famous Mystic yards, Norwich, is at a dead standstill. Iron-molding feels the increase in the price of raw materials without improved prices.

In the Middle States, manufacturing generally shows great improvement, and all the prospects are encouraging.

NEW YORK

manufacturers report activity in their business. Profits are small and wages low, but orders have come in thus far this season in greater numbers than could be filled. Employment has thus been given to a large number of workmen who would have otherwise been idle. Every manufacturing in Central New York is running on full time, and good wages are paid. Not a single establishment has been closed up within a year, but, on the contrary, several new ones of considerable magnitude have been established, giving employment to large numbers of skilled workmen.

The iron furnaces at Poughkeepsie are in full blast. The iron industry at Paterson,

NEW JERSEY,

is slowly but steadily improving, and locomotives going through the streets from the shops to the railroad are once more a familiar sight. Locomotives sell for less than half what they readily brought a few years ago. The manufacture of silk machinery is growing to be a great industry in Paterson. The prices of labor have advanced materially within a few months; common laborers are scarce at \$1.25 per day. Skilled mechanics are in demand, and the idlers on the street corners have almost disappeared. The iron works and machine shops at Trenton—New Jersey Steel and Iron Company, Trenton Iron Company, Phoenix Iron Works, Roebling's Sons' Mills, Mackenzie & Wilkes—are working night and day.

Outside of the operations of her merchants and traders, the chief sources of revenue of Harrisburg,

PENNSYLVANIA,

are her furnaces, rolling mills, steel works, nail mills, car factories, foundries, &c. These establishments, which in the flush times during the war employed thousands of workmen and in the sad days since the collapse of 1873 have stood silent and deserted, have nearly all resumed their wonted activity. Among them are four large furnaces, seven foundries, several large rolling mills, a boiler and tank works, large nail mills, the Harrisburg Car Works, which is now busy on a large contract for freight cars, and the steel works, to which large additions are now being made, with a view to the increase of its capacity. At many of these establishments the employees are working on full time, with a prospect of a speedy increase of force. These industries require large quantities of fuel, and if it were possible to obtain that at a reduction from present prices, every furnace in the State would soon be in blast. Almost the only cloud at present on the industrial horizon of Pennsylvania is President Grover's prophecy of a speedy advance in the price of coal. That is the ghost that now disturbs the peace of the Pennsylvania ironworker.

At Easton the railroads and canals have been busy for several months in carrying anthracite to market. The factories and furnaces are beginning to feel the effects of the returning good times. The mining and manufacturing enterprises of the Lackawanna Valley, which form the principal support of Scranton, are unusually active. The great works of the Lackawanna Iron and Coal Company, of which W. W. Scranton is general manager, are running night and day in full blast, turning out steel to fill orders from all parts of the United States. Last week the company advanced the wages of its laborers 10 cents a day, and cash payments are promptly made monthly. The extensive car shops of the Delaware, Lackawanna and Western Company are overflowing with orders, and the same may be said of the Pennsylvania Coal Company's works at Dunmore, east of the city. The mines are all working nearly full time, and in every department of industry the condition of things is decidedly encouraging. The situation has not been so favorable at any time during the past five years as it is at present.

The Pennsylvania Coal Company, at Pittston, with its thousands of employees, is working mostly full time. The Union Stone and Manufacturing Company, which employs several hundred hands, is pushed to its utmost capacity. The business prospect is better than it was either in 1877 or 1878, and, with the expected advance in the price of coal, the anthracite region will again show an increase in all the different mercantile pursuits.

The large shipyards and car works of the Harlan and Hollingsworth Company, at Wilmington,

have not been busier for years, and keep over 1000 hands in steady work. Last spring they were almost idle. This state of affairs prevails at the car works of the Bower & Duer Company, at the car and shipyards of Jackson & Sharp, and at the great works of Pusey, Jones & Co., as well as at all the smaller places. In the factories in the adjoining villages there is much work.

The principal manufactures of Wheeling, WEST VIRGINIA, are glass and nails, the latter being placed upon the market at such reduced prices that it is not profitable to manufacture them. The glass trade is growing rapidly, and, in consequence, the two works in the city are kept very busy, in order to fill the demand for their wares.

The manufacturing industries of Rome, GEORGIA, are chiefly iron, and these have within the past few weeks received quite an encouraging impetus.

The reports from Columbus, OHIO,

state that the business outlook has materially improved during the past year. M. M. Green, president of the Hocking Valley Railroad, the chief business of which is the transportation of coal and iron, states "that their business has gradually increased during the past year. Several new furnaces are preparing to go into operation, and more confidence is expressed among those interested in mining interests. While no great enterprises are being started, the general tone of business is more healthy, the capitalists moving with more caution, feeling their way at every step. The railroad traffic on all lines had steadily increased, but the competition had been sharp, which made necessary low rates, but the marked improvement in the business had kept up the earnings, if not advanced them." Other railway officers express similar views, and believe that, with a settled currency, the future is encouraging. The iron and steel interest has shown a marked improvement in tone. Although the advance in the price of ores has not been large, much of the stock on hand has been disposed of, so that comparatively little of the old remains.

The Aultman & Taylor Company, Mansfield, makers of thrashers and farm engines, work their 300 men 12 hours a day. They have just completed a large brick and iron shop, and have finished one of the finest offices in Ohio. The Mansfield Machine Works, long struggling against a heavy load of real estate, are running to their fullest capacity.

The manufacturing industries in IOWA are increasing in numbers, variety and capital invested. Railway construction has revived very rapidly within the past twelve months, and many new lines and extensions are being built in various parts of the State. At St. Louis,

the hardware business has been very brisk all spring, showing a market increase over the trade of 1876. From

KANSAS large sales of agricultural implements and nails are reported. The

COLORADO mines show a steady increase in product, and new discoveries are the order of the day. Immigrants are pouring in at the rate of 15,000 per month. All the cities, towns and camps are running over full; new towns are springing up and building is lively. From 3000 to 4000 men are employed in the construction of railroads, wagon roads and canals.

Wm. L. Scott, Chairman. W. S. Brown, Treas.

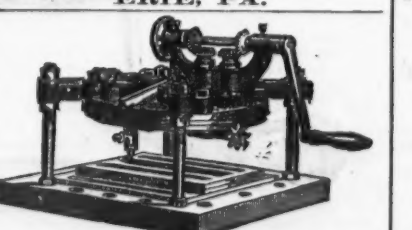
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The Mount Hickory Furnaces, located at Sharpsville, Mercer County, Pennsylvania, and the Erie Rolling Mill of this city, having been consolidated under the Limited Partnership act of this State, under the name and style of the Mount Hickory Iron Company (Limited), are now prepared to receive orders for the various sizes of

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We propose to retain, if possible, the well-known reputation of the Mount Hickory Furnaces for Bessemer, Pig and Foundry Irons, and as we shall only use in our furnaces the best qualities of Lake Superior ores, from which our Merchant Bar will be manufactured, we hope to fully meet the wants of customers who wish first-class iron.

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PATENT PORTABLE VALVE SEAT ROTARY PLANING MACHINE.
Manufactured by the
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Descriptive Circular on application.

HYDRAULIC JACKS AND PUNCHES,

FOR
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HYDRAULIC PRESSES

On hand and made to order. Second-hand Hydraulic Presses bought and sold. Machinery for Polishing and Buffing Metals. Send for Circular.

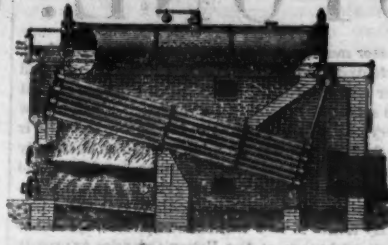
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OVER 35,000 HORSE-POWER NOW IN USE. ADAPTED FOR ALL PURPOSES.

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In Sections Easy of Transportation.
No Bolted, Screwed or Packed Joints.
All Joints Made by Expanding Wrought Iron Tubes into Bored Holes.
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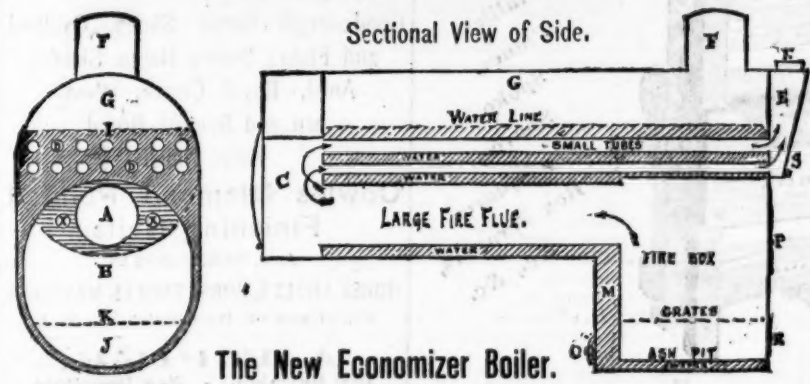
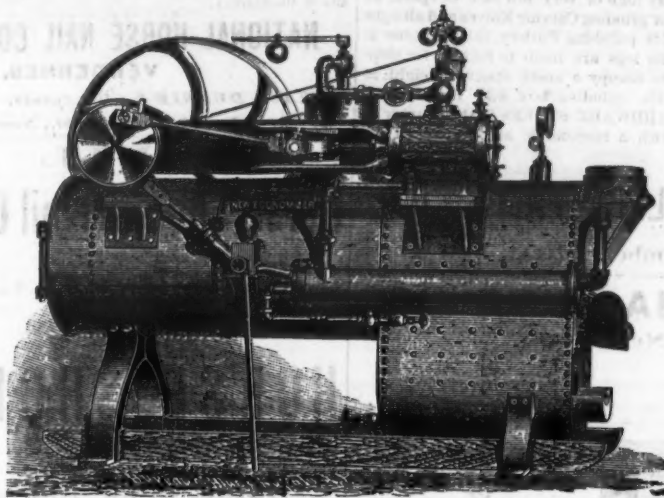


Easily Cleaned from Soot or Sediment.
Adapted to all kinds of Fuel.
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No Leaks from Unequal Expansion.
Rapid Steaming.
Highest Attainable Economy.

CENTENNIAL EXPOSITION MEDAL AWARDED THIS BOILER FOR HIGHEST ECONOMY AND EFFICIENCY ON TEST.
Illustrated Circulars and other desired information promptly furnished. **BABCOCK & WILCOX, Engineers, 30 Cortlandt St., N. Y.**

THE NEW ECONOMIZER,

The Only Agricultural Engine with Return Flue Boiler in Use.



The New Economizer Boiler.

This Boiler contains all the good points of an ordinary locomotive boiler; the fire-box is entirely surrounded by water, and the flames pass through the large fire-flue almost in a body. There is no obstruction whatever to the draft. The returning of the flames through the small tubes compels the deposit of the great body of sparks in the chamber at rear (C). We claim it is the safest boiler in the market, there being almost entire immunity from sparks, on account of the return flue idea. It is the best steaming boiler made, and we will invite competition with any first-class maker. It will make more steam with the same fuel than any horizontal boiler built. Send for Price List. We invite correspondence, and will furnish full circulars, photographs, &c., on application.

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Iron and Brass Wood Screws.

We manufacture a full line of
IRON AND BRASS SCREWS.

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BAND SAW MACHINES.

BAND AND SCROLL SAWS.



KIMBALL & KIMBALL,
Manufacturers,
639 Arch St., Philadelphia.

Saws in all sizes, widths and lengths on hand and made to order. Special arrangements will be made with the Hardware trade. Correspondence solicited.

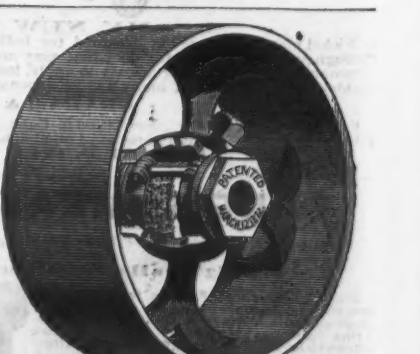
THE THOMPSON Apple Parer, Corer and Divider Combined.

Manufactured Exclusively by the
NEW ENGLAND BUTT CO.,
Providence, R. I.
Patented August 14, 1877.



The attention of the Hardware trade is respectfully called to the many important advantages possessed by this machine, which make it the most practical and saleable Combined Parer and Divider in the market, such as durability, perfect work, low price, ease, convenience and great rapidity of operation, performing the entire work of paring, coring and dividing an apple into six parts and discharging the core from the fork by a single sweep of the lever. Is worked over a tub or box, and the cores separated from the prepared fruit as shown in cut. Nothing claimed for it that a trial will not readily demonstrate.

For machines or circulars address the manufacturers, or
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W. OESTERLINE,
29 Allison St., CINCINNATI, OHIO.
Send for Circulars and Price List.

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Harris Wm. A., Providence, R. I. Harris Wm. A., Providence, R. I.	31
Lane & Bodley Co., Cleveland, O. Lane & Bodley Co., Cleveland, O.	31
Shapley & Wells, Birmingham, N. Y. Shapley & Wells, Birmingham, N. Y.	31
Wetherill Bolt & Co., Chester, Pa. Wetherill Bolt & Co., Chester, Pa.	31
Bunger M. E. & Co., Indianapolis, Ind. Bunger M. E. & Co., Indianapolis, Ind.	31
Export Factors Jennings S. H., Deep River, Conn.	31
Faucets, Brass, Makers of Faucets, Brass, Makers of, 5 John, N. Y.	31

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Wood W. D. & Co., Pittsburgh, Pa. 1

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Baltimore Mfg. Co., 333 Washington, Boston 1
Winn, R. D., Windsor, Vt. 1

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DuBrul N. & Co., Cincinnati, O. 1
Howard & Morse, 45 Fulton, N. Y. 1

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Hart, J. Israel H. & Co., Philadelphia 1

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Mast, Fosco & Co., Springfield, Ohio. 1
Ohio Mfg. Co., Cleveland, O. 1

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Dietzen Henry & Sons, Philadelphia 1

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Hoyt Fred J., 733 Broadway, N. Y. 1
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Yale Lock Mfg. Co., 53 Chambers, N. Y. 1

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Box Alfred & Co., 313 Green, Phila. 1
Fullard E. P., 14 Deu, N. Y. 1
Phillips, J. W., 100 Chambers, N. Y. 1
Garvin E. E. & Co., 139 Center, N. Y. 1
Hillman, J. W., 100 Chambers, N. Y. 1
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Niles Tool Works, Hamilton, O. 1
Patterson, J. W., 100 Chambers, N. Y. 1
Pratt & Whitney Co., Hartford, Conn. 1
Sellers Wm. & Co., 1500 Hamilton, Philadelphia 1
The Erie & Parker Press Co., Middletown, Ct. 1
Lester, R. & Co., Chester, Pa. 1
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Harrington E. & Sons, North 13th st. and Pennsylv-
ania ave. 1
Wells Bros., Greenfield Mass. 1

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Read, D. W. R. & Co., 2034 Walnut, Phila. 1
Sellew R. & Co., St. Louis, Mo. 1
Smith, J. W., 200 Washington, N. Y. 1
Sova, Nova Scotia 1

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Ironclad Manufacturing Co., Brooklyn, N. Y. 1

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Fiske & Hunt, Baltimore 1
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TRADES.

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"We do not see how we could do without your
paper. It gets better and better. We get more in-
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other papers we can get."

From DAVID FISK, Geneva, Ohio.

"I like The Metal Worker very much. You may con-
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From W. E. RYAN, Stoves and Tin, Jasper, Ind.

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CARPENTRY AND BUILDING.

A new illustrated monthly publication, devoted
to all branches of the wood-working and building
trades.

It will be eminently practical, treating only of
those subjects which interest the trades addressed,
and giving information which every one connected
with the building industries can make useful in his
daily work.

It will be liberally illustrated with wood cuts,
plans, details, &c., and no expense will be spared
to give it of real value to all intelligent mechan-
ics which it treats.

It will be discussed, may

THE IRON AGE.

A REVIEW OF THE HARDWARE, IRON AND METAL
TRADES.

The circulation of The Iron Age is more than
double that of any other journal of its class in the
world.

Established in 1855 under the name of The Har-
dware Man's Newspaper, changed in 1859 to The Iron
Age, it is the oldest publication of its class in the
world. The next in age is the Ironmonger of
London, established in 1859. Until 1870 The Iron
Age was the only publication of its class in the
United States.

The largest newspaper in the world is The Iron
Age, each number of which is much larger than
any of the London Times, and contains over 25 per cent.
more of news and information than any of the
London Times.

The Iron Age is published weekly, except on
Sundays and public holidays, and is sent to all
subscribers by mail, free of postage.

Advertisements are received on reasonable
terms, and will be made known on application;
but no advertisements of doubtful character, or
which we have reason to believe are calculated to
mislead or deceive our readers, will be taken at
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HENRY DISSTON & SONS

KEYSTONE SAW, TOOL,



STEEL and FILE WORKS,

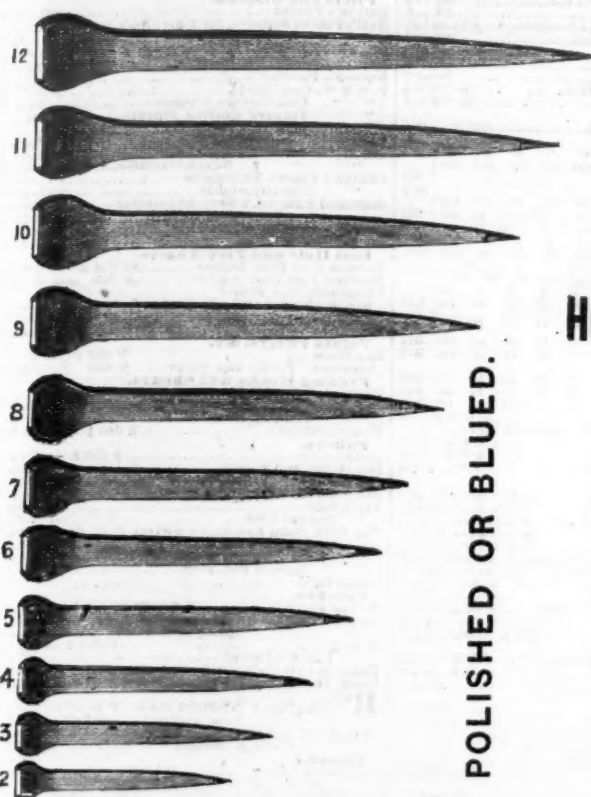
Front and Laurel Streets, Philadelphia,
MANUFACTURERS OF

SAWS OF ALL KINDS, FILES AND TOOLS, AND SPECIAL GOODS MADE FROM SHEET STEEL.

All goods stamped Henry Disston & Sons, and bearing our trade mark, are fully warranted.

Branch Works, Tacony, Philadelphia.

Branch House, Randolph & Market Streets, Chicago, Ill.



POLISHED OR BLUED.

AUSABLE HORSE NAILS,

Twisted, Bent and Drawn
COLD.

Hot Forged and Cold Hammered Pointed,

Are the only Nails in market that are made in imitation of the Hand Process. They have the uniformity of Machine Nails and the toughness of those hammered by hand. Our

HOT FORGED AND COLD HAMMERED POINTED NAILS

Are the Standard Nails,

and are acknowledged to be the best in the market. They are used by the best shoers in New York, Brooklyn, Philadelphia, Chicago, Saint Louis, Milwaukee, Baltimore, &c., and

GENERALLY THROUGHOUT THE UNITED STATES.

They also compete successfully in Foreign Countries with machine and hand-made Nails of their own manufacture.

AUSABLE HORSE NAIL CO.,

4 Warren St., New York.



Steam and Frost prevented on Show Windows.



REVOLVING VENTILATORS

For everything (and every size), from a hat or cap to an exhibition building.

Kitchens, Laundries, &c., ventilated without draft. Durable, strong, without rivets or solder. Oiled for six months. Each one has storm cap. Retail price, size six inch diameter, \$1.00 and upwards; apparatus with which any one can cut circles in glass, 15 cents each.

Protective Ventilators avoid drafts, exclude dust, dampness, malaria and germs of disease; adopted by hospitals, schools, institutions, &c.; applied to any window or room.

Prof. A. L. Loomis, M. D., University of City of New York, writes as follows:

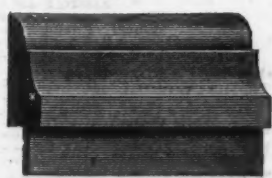
"From my personal experience and that of my patients who have used your Ventilator during the past six months, I am convinced that your method of removing dust, impurities and dampness from the atmosphere is the best which has as yet been proposed. By it the air in an apartment can be constantly changed without causing drafts. I would especially recommend its adoption in sick rooms, sleeping apartments, nurseries and school rooms."

Air Filters and Moisteners, placed over hot-air registers of furnaces, &c., prevent dust and supply steam filtered air. Prices and discounts to the trade sent on application.

The "Economy" Molding Weather Strip is perfect in every respect. By enlarging edge of rubber or felt, and making slot in molding to correspond (see engraving), we save all after expense of molding. Once purchased it will last a lifetime, because rubber, etc., has only to be removed by taking old piece out of either end of molding, and sliding in a new piece. By this method of securing rubber all uncertainty of fastening or undoing of glue or tacks is overcome.

Rubber supplied with enlarged edge and instructions to enable Car Manufacturers, Carpenters, Builders and far off trade to make slots in Sashes, Doors, Mouldings, &c., and thus make perfect Weather Strips.

No. 6.



BRACHER VENTILATOR CO., No. 3 Park Row, New York.

THE PENFIELD BLOCK WORKS, Lockport, N. Y.

Manufacturers of

PULLEY BLOCKS,

Iron and Wood,

Lignumvitæ Sheaves, Iron Sheaves, All Steel Roller Bushings, Common Sense Hoisting Blocks, Giant Car Pushers, Lock Faucets, &c.

All kinds Lignumvitæ Work. Ten-Pin Balls any size.

Headquarters for every style and kind of

TACKLE BLOCKS.

No. 11, Triple Block Iron Strapped.



WM. H. HASKELL & CO.

Pawtucket, R. I.

MANUFACTURERS OF

COACH SCREWS

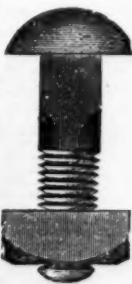
(With Gimlet Points),

ALL KINDS OF

Machine and Plow Bolts,

FORCED SET SCREWS,

AND
TAP BOLTS.



Mica and Porcelain Materials.

THE CHESTER MICA AND PORCELAIN CO.

OFFER

Mica of the Best Quality,
Feldspar of highest Standard and Purity,
Quartz, the Finest, Whitest, Best.
Kaolin, Asbestos and Baryta.

Best Terms, Wholesale and Retail.

Address, CHESTER MICA AND PORCELAIN CO., 87 Liberty St. New York.



Bemis & Call Hardware & Tool Co.

PATENT COMBINATION WRENCH.

These Wrenches are made from the best of Wrought Iron, with Steel Head and Jaw, case-hardened throughout, and not only combine all of the superior qualities of our Cylinder or Gas Pipe Wrenches, but also all requisite Combinations of a regular Nut Wrench, thus making a combination which has no equal.

For Circulars and Price List, address

BEMIS & CALL HARDWARE & TOOL CO., Springfield, Mass.

Bergen Port Spelter.

MINES: Lehigh Valley, Pa. WORKS & FURNACES: Bergen Port, N. J.

The only Miners and Manufacturers of

PURE

LEHIGH SPELTER

From Lehigh Ore.

Especially adapted for

Cartridge Metal and German Silver.

Also manufacturers of

BERGEN PORT OXIDE ZINC.

Superior for Liquid PAINT on account of its body and wearing properties.

F. OSGOOD & CO., Proprietors.

E. A. FISHER, Agent, 13 Burling Slip, N. Y.

A. B. GUNNISON,

MANUFACTURER OF

WOOD PUMPS

ERIE, PA.

ESTABLISHED - 1856

Warranted Genuine

Cucumber Pumps & Pipes. Also Poplar Pumps, Lined Pumps, &c.

The Trade Supplied by

H. B. GRIFFING,

60 Cortlandt St., N. Y.

P. MANN, Washington, D. C.

SCOBIE, HARRISON & PAR

KPR, 123 Liberty Street, Pitts

burgh, Pa.

KNECHT & THOMAS,

Winchester, Ind.

—AND BY—

A. B. GUNNISON

Manufacturer, ERIE, PA.



THE "EDDY" STRAIGHTWAY

VALVES.

ALSO,

FIRE HYDRANTS.

Axe, Hatchet, Powder and Brush

Machinery.

MOHAWK & HUDSON MFG. CO.,

WATERFORD, N. Y.

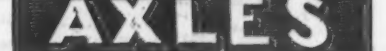
AXLES

All kinds Wagon & Carriage Axles

Manufactured by the

LANBERTVILLE IRON WORKS,

LANBERTVILLE, N. J.



New York Wholesale Prices, May 28, 1879

[illegible]

AMERICAN SCREW CO.,

Providence, R. I.,

MANUFACTURERS OF MORE THAN 4000 VARIETIES OF PRODUCT,

AND INCREASING THE ASSORTMENT DAILY.

Machinery employed contains important inventions recently patented, and which are designed to produce Screws at a **lower cost to the consumer** than has ever been attained.

All goods are distributed through the Hardware trade, to whom a liberal discount will be allowed.

INTERNATIONAL EXHIBITION.

No. 235,

PHILADELPHIA, 1876.

The United States Centennial Commission has examined the report of the Judges, and accepted the following reasons and decreed an award in conformity therewith.

PHILADELPHIA, November 8, 1876.

REPORT ON AWARDS.

Product: Iron, Brass and Steel Screws, Tire and Stove Bolts, Rivets.

Name and address of Exhibitor: American Screw Company, Providence, R. I.

The undersigned having examined the product herein described, respectfully recommends the same to the United States Centennial Commission for Award, for the following reasons, viz: **Being of a quality nearly approaching perfection, showing the highest attainment in this branch of manufacture.**

G. L. REED, Signature of the Judge.

Approval of Group Judges.

Daniel Steinmetz,
Jas. Bain,
Chas. Staples,

G. L. Reed,
J. D. Imboden,

J. Diffenbach,
Dav. McHardy

A true copy of the record. FRANCIS A. WILKER, Chief of the Bureau of Award.
Given by authority of the United States Centennial Commission.

[L.S.] J. L. CAMPBELL, Secretary. A. T. GOSHORN, Director-General.
J. R. HAWLEY, President.



After forty years' experience we offer to the trade our Centennial Screws, patented May 30, 1876, as the best we have ever known.

The method of manufacturing is also patented, and we are changing our machinery as fast as possible, to manufacture the improved article only. To introduce them, they will be sold at the same price as the old style screw.

The new screws will be packed in manila colored boxes with the new label covering end of box, and enlarged figures showing plainly contents.

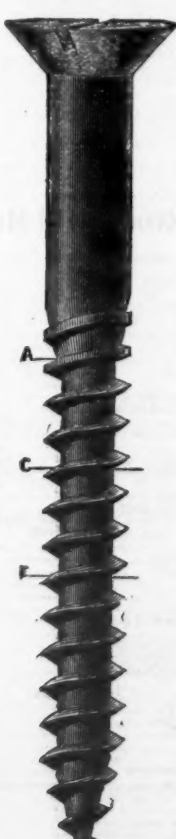
To distinguish this screw we have adopted a trade-mark, which is also secured to us.

The accompanying engravings show the progress of making screw from the old blunt point to style now adopted.

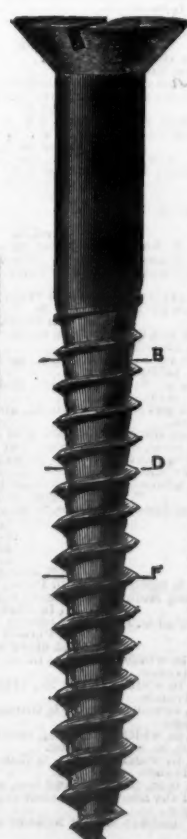
Experience has shown that the wear point of screws, as formerly made, is at the heel of the thread, where all



1846.
Patented August 30.



1876.
Patented May 30.
COVERED BY TRADE MARK.



Section at Line A B

Section at Line C D

Section at Line E F

Section at Line A B

Section at Line C D

Section at Line E F

Estimated to be FIFTY PER CENT. stronger than a Screw as Commonly made.

the strains of forcing the screw into the wood naturally concentrate.

To avoid the sharp angle existing in the old style of screws has been the aim of all manufacturers, but every expedient hitherto adopted has proved as objectionable as the evil complained of.

It will be seen in our new screw that not only is the sharp angle avoided, but the strength very much increased, as illustrated. See sections at lines.

CLAIM.

"A Pointed Wood Screw having the outer periphery of the thread upon its body cylindrical, while a portion of the body below the thread and near the neck is conical, the remainder of the body to the point being cylindrical, and yet having all the thread brought to an edge of a constant angle, without jogs in the paths between the threads, substantially as described."

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Established 1845.
Office, foot of Houston Street, East River,
NEW YORK.
The largest stock of Fire Brick of all shapes and
sizes on hand and made to order at short notice.
Cupsels Brick, for McKenzie Patent,
and others. Fire Mortar, Ground Brick, Clay and
sand. Superior Kaolin for Rolling Mills and found-
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from my own mines at New Jersey and Staten
Island, by the cargo or otherwise.

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Successor to
PALMER, NEWTON & CO.,
ALBANY, N. Y., Manufacturers of

FIRE BRICK Stove Linings, Range and Heater Linings Cylinder Brick, &c., &c.

M. D. Valentine & Bro

Manufacturers of
FIRE BRICK
And Furnace Blocks
DRAIN PIPE & LAND TILE.
Woodbridge, - - - N. J.

A. HALL & SONS, Perth Amboy, N. J.
ESTABLISHED 1844.
HALL & SONS, Buffalo, N. Y.
ESTABLISHED 1866.

FIRE BRICK
of reliable quality for all purposes, manufactured of
the best New Jersey Fire Clays. Also, Architectural
Terra Cotta, Fire Clay, Fire Sand, Kaolin, Ground Fire
Brick and Diamond Building Brick.

Brooklyn Clay Retort AND FIRE BRICK WORKS.

Manufacturers of Clay Retorts, Fire Bricks, Gas
House and other Tile, Cupola Brick, &c. Dealers in
and Miners of Fire Clay and Fire Sand. Clay bank at
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Office No. 22 Van Dyke St.

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Manufacturer of
FIRE BRICK,
For Rolling Mills, Blast Furnaces, Foundries,
Gas Works, Lime Kilns, Tanneries, Boiler
and Grate Setting, Glass Works, &c.
FINE CLAYS, FIRE SAND, AND KAOLIN FOR SALE.

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Manufacturer of FIRE BRICK, HOLLOW
BRICK AND CLAY RETORTS.
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Office & Depot: 418 to 422 East 33d St., N. Y.

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ESTABLISHED 1845,
Manufacturers of
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Tuyeres, Tiles, Blast Furnace Blocks, etc. Miners and
Dealers in Woodbridge Fire Clay and Sand, and Staten
Island Kaolin.

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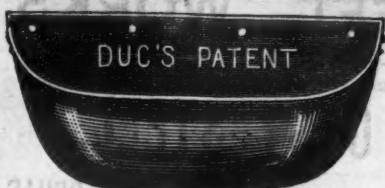
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Clay Gas Retorts and Retort Settings,
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Clay Gas Retorts,
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Tiles, Blocks, &c., &c.
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Eighteen years' practical experience.
CYRUS BORGNER. WM. J. O'BRIEN



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THE STORE-HOUSE BUCKET.
(Partial straight front.)
In 12 in., 14 in., 16 in. and 17 in. Sizes.

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No Corners to Catch.
Light Running and Very Durable.
The only Scientifically Constructed Elevator Bucket
in the Market.



THE
MILL BUCKET.
In 3 1/2 in. to 10 in.
Sizes.

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Sole Manufacturer,

CONTINENTAL WORKS, Brooklyn, E. D., N. Y.
Send for Circular.

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ALSO

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Manufactory and Offices at Providence, R. I.

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SLIM HAND-SAW TAPERS

Are made considerably lighter, but in every
other respect like the ordinary hand-saw file;
the lengths range from 4 to 12 inches (by
inches only), being made from the sizes of
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Lengths of Slim Hand-Saws.....	4	5	6	7	8	10	12	inches.
Sizes of Three-Square Sections.....	3	3 1/2	4	5	6	8	10	inches.

The slim hand-saw file is, to a considerable
extent, taking the place of the regular pattern
saw file; the principal advantage claimed (par-
ticularly among the smaller sizes) being the
greater sweep or stroke which is obtainable in
files of a corresponding size.

The two cuts herewith given show the
comparative length of the slim and regular
hand-saw files, both being made from the same
size stock.

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Butchers' Cleavers,
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Axes and Hatchets,
Grub Hoes and Mattocks,
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AND PAINTERS' COLORS
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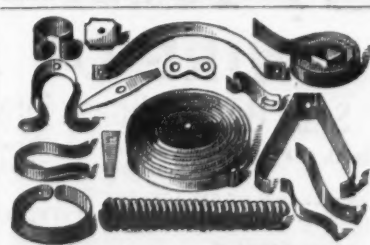


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Nos. 1 (coarse) to 4 (fine), unequalled in strength, quick-
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Great Agricultural Show in London.

In connection with the great International Show of the Royal Agricultural Society in London, during the first week of July, will be issued a full report of the proceedings, exhibits, prizes, &c., together with several contributions by acknowledged authorities on cognate subjects. The whole of this matter will be contained in a

SPECIAL ISSUE OF THE "IRONMONGER,"

which will not only be of large size, and compiled in the most enterprising manner, but will have an

EXTRA CIRCULATION

FIVE THOUSAND COPIES

among ironmongers, agricultural implement and machinery makers, dealers, exporters, importers, &c., the world over,

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The proprietors hope, in fact, to place that issue of the *Ironmonger* in the hands of every one who is interested in the manufacture or sale of these articles: therefore,

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desirous of bringing their productions *prominently and surely* before those who can influence sales, should not fail to have their advertising announcements attractively displayed in it. It is well known that American implements sell more freely in Great Britain than any other goods of transatlantic origin. Large numbers of German, French, Dutch, Belgian, Danish, Swedish, Russian and other buyers and importers are certain to visit the show, which will surpass all hitherto held in size and importance. Notwithstanding these inducements there will be

NO ADVANCE IN THE TARIFF

on the occasion, but the usual charges (see prices below, or our ordinary weekly advertisement in *The Iron Age*) will be unaltered.

All Orders and Blocks should reach us not later than July 2. We shall have an office on the Show Ground.

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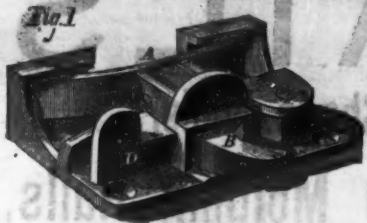
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THE PERFECT SASH TIGHTENER AND LOCK.



Manufactured entirely from Malleable Iron, Burglar Proof, Anti-Rattling, Draws Sash to Exact Center. No Springs to Get out of Order.
The Best in the Market.

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For either Wire or Rope Line, Will securely hold any article, from a silk handkerchief to a carpet. No article can be blown away. Does not soil the clothing. Manufactured by
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Who keep a general assortment on hand for the country trade. *Jewett's Horse Ramps*, 14, 15 and 16 inch, *Maharaj's* \$10 Tire Shrinker, *Heller's Ramps*. Send for Circular.

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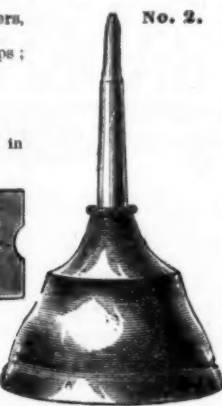


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Send for Price List.

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Adjustable Stock and Dies

For Pipe and Bolts,

Have the following advantages:

- 1st.—The Armstrong Improved Dies can be adjusted to the variations in the size of fittings.
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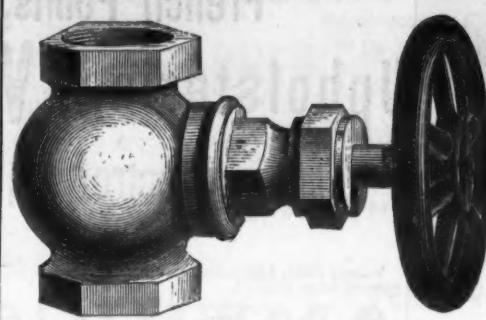
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For STEAM, WATER and GAS.
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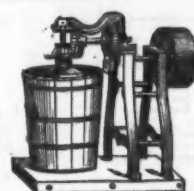


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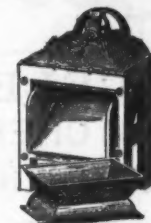
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Galvanized iron outside, tin inside. No secretions of cold or ice need be feared in the use of this Freezer. Simple in construction, perfect in results. Send for descriptive circular and discounts of this celebrated Freezer. Address
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IMPORTANT FOR ALL LARGE CORPORATIONS AND MANUFACTURING CONCERNS.

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WEYMOUTH'S PATENT.



This knife is the best in use for cutting down hay and straw in mow and stack, cutting fine feed from bale, cutting corn stalks for feed, cutting peat and ditching marches.

The blade is best cast steel, spring temper, easily sharpened, and is giving universal satisfaction. A few moments' trial will show its merits, and parties once using it are unwilling to do without it. Its sales are fast increasing for export as well as home trade, and it seems destined to take the place of all other Hay Knives.

They are nicely packed in boxes, one dozen each, of 50 lbs. weight, suitable for shipping by land or water to any part of the world.

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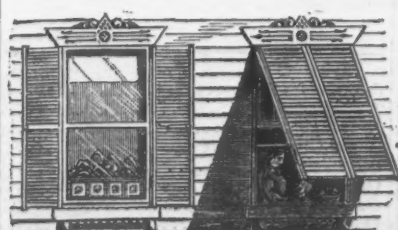
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Dearborn's Pat. Adjustable Blind Awning Fixtures.



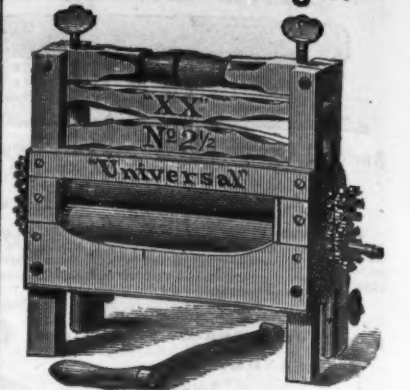
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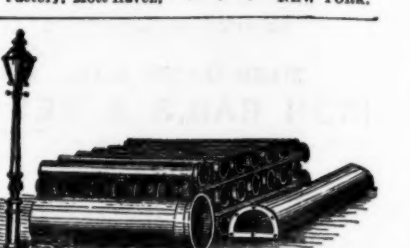
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Water Closets,

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The Patent Combined Dinner-Pail and Lantern.

The most perfect Dinner Pail in the world. Hot coffee for dinner and a Lantern at night.

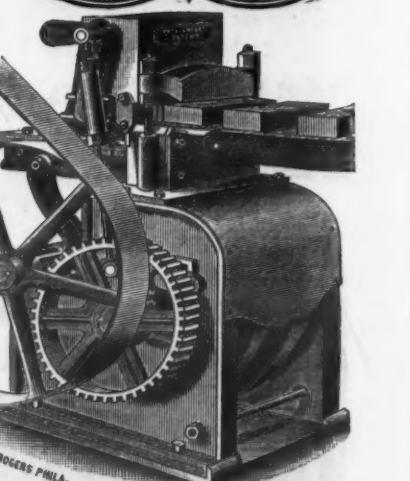
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We call the attention of the trade to these Wrought

Brass and Iron Bolts, as being the best and cheapest

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and bed-plate to the wood; no others are required;

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We also manufacture all kinds of Brass and Tin

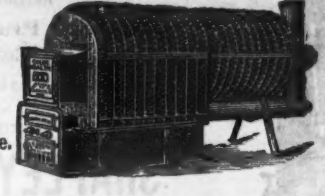
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Drills for Coes, Worcester, Hunter and other Hand Drill

Presses, Beach's Patent Self-Centering Chucks, Center

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All Tools exact to Whitworth Standard Gauges.

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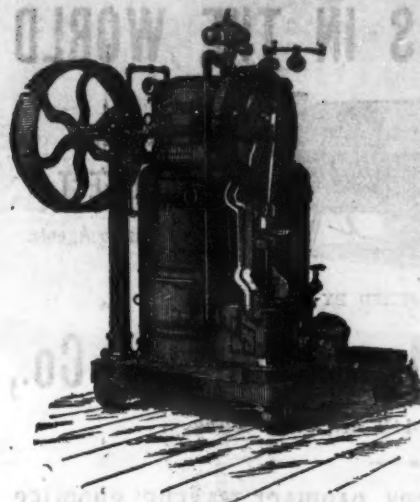
RHODE ISLAND HORSE SHOE CO.,

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Reissued June 23, 1875.
Compact, Practical, Durable and Economical.

Acknowledged to be the best in use. This boiler stands unrivaled.

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For hoisting Coal, Ore, Ice, or other heavy work, where Steam or Horse power is used. Made of Galvanized Iron and Steel, and not affected by exposure to weather.

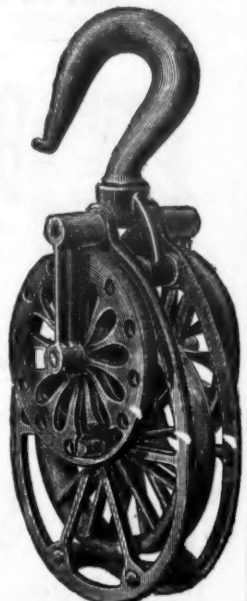
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The Block uses 3 inch to 4 inch rope, and will sustain with safety a load of 4 tons.

Will run either end up, or on its side. The lightest running and most durable Block yet produced.

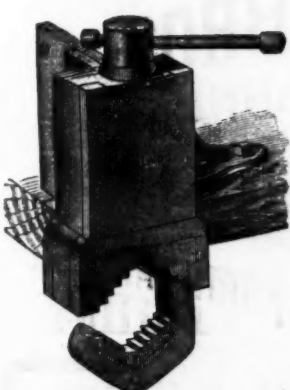
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Send for Price List of Blocks.

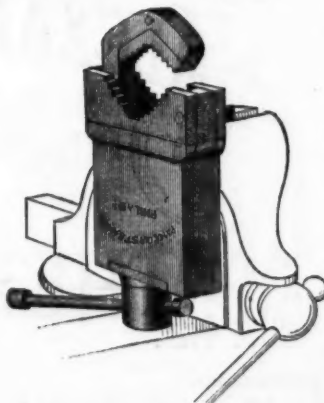


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STRONG,
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To meet the requirements of the large number of persons who have use for such an article, we invite attention to our Improved Pipe Vise. This Vise can be used either as a permanent fixture to work bench, attached to angle plate or can (unlike others) be held between the jaws of any Machinist's or Blacksmith's Vise; the movable jaw being OPEN ON SIDE permits work to be gripped at any desired point without slipping it in from end, and allows of FITTINGS BEING HELD SECURELY; the Box is made of Malleable Iron, the Screw of Wrought Iron, and the remainder of Solid Steel throughout. The Steel Gripping Jaws can be duplicated and replaced at any time when worn out. It is a very convenient tool, well adapted to the wants of Plumbers, Pump Fitters, Well-Drivers, and all who have use for a tool that is strong, light, efficient and cheap which can be readily carried about with kit of tools.

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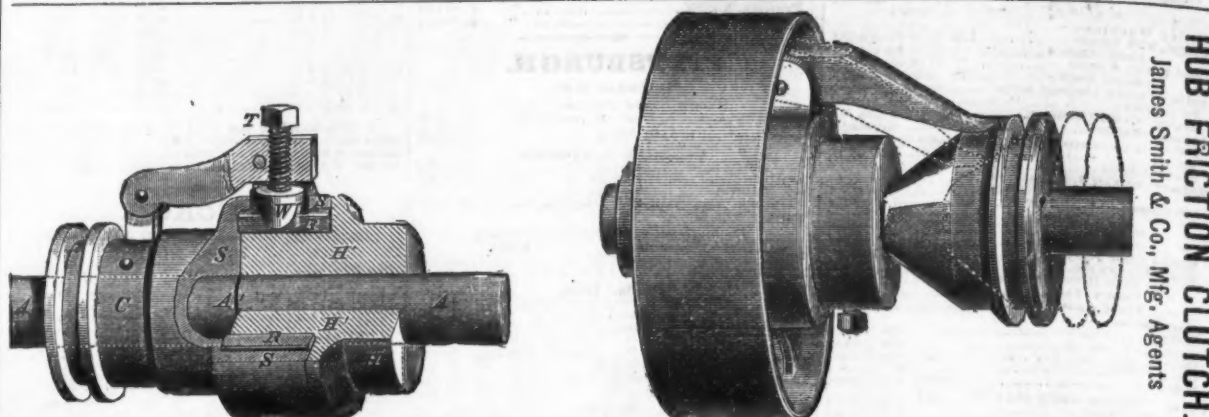
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Manufacturers of GALVANIZED PUMP CHAIN FOR CHAIN PUMPS.



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Manufactured only by
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PATENT HUB FRICTION CLUTCH.

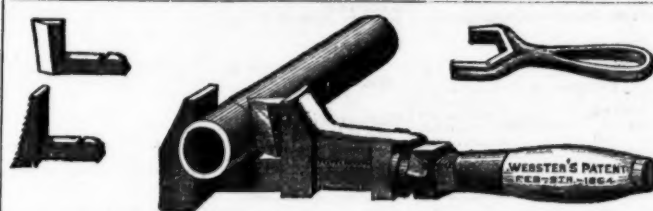
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We claim for this device the following advantages for a perfect clutch, it having been adopted by several of the leading manufacturers of machinery and machinists' tools: It works easily but effectively. It works instantly and without noise. It is very durable, and is extremely simple and cheap, and has proven itself to be the best clutch in the market. Special arrangements can be made with leading manufacturers for the adoption of this clutch for their own tools. This clutch can and will be sold for less money than any other clutch in the market.

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This **WRENCH**
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one Tool

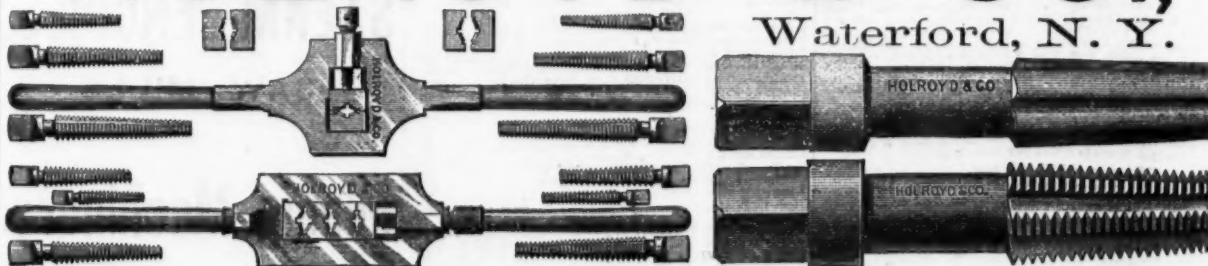
THE
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Also, Engineers' and Machinist Supplies in great variety. Chain, Anvils, Belting, Packing, Hose, &c.

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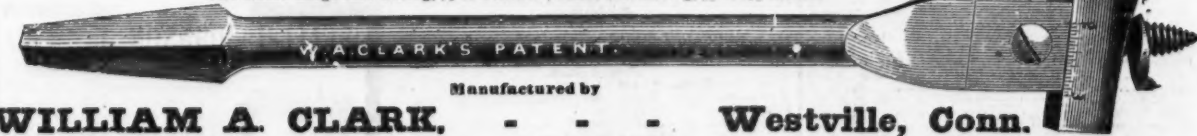
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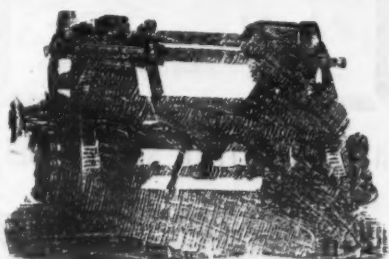
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Two sizes: Large Size Boring, 1/4 to 3 inches; Small Size Boring, 1/8 to 1 1/4 inches.



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Manufactured by **H. A. RAMSAY & CO.,**
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GREAT REDUCTION IN PRICES.

CLIMAX REFRIGERATOR

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No Drip Pan to Soil the Carpet.
Self-purifying. Cold, dry and pure air. Inner case made entirely of Galvanized Iron. Send for catalogue and reduced price list.

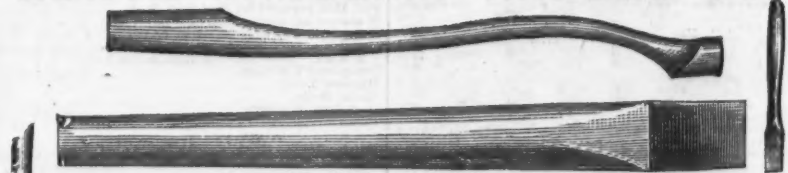
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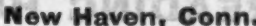
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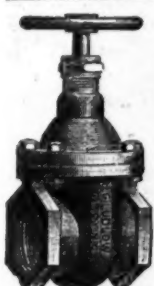
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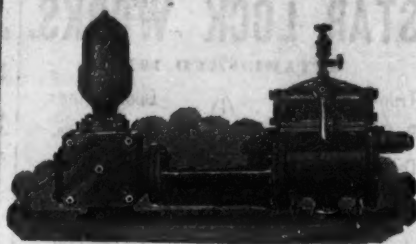
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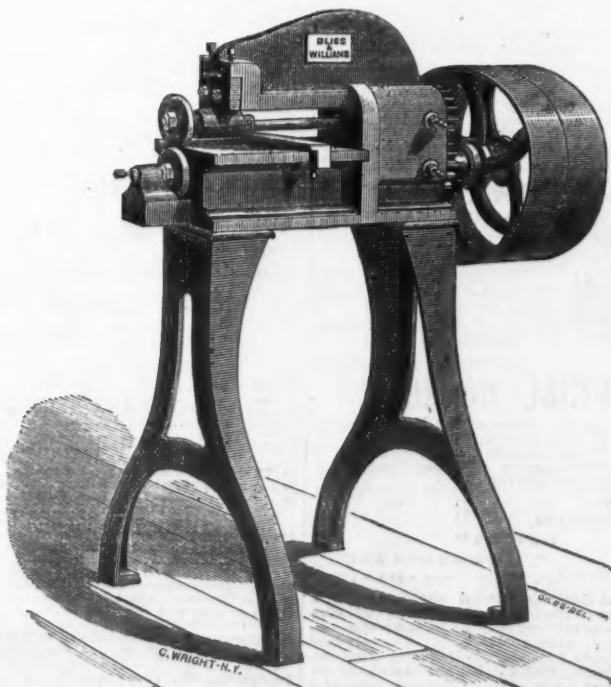
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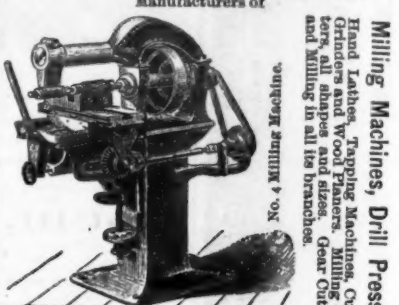
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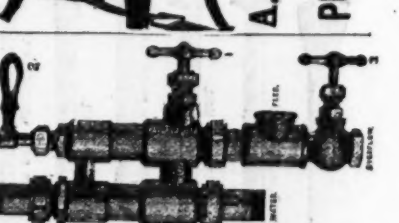
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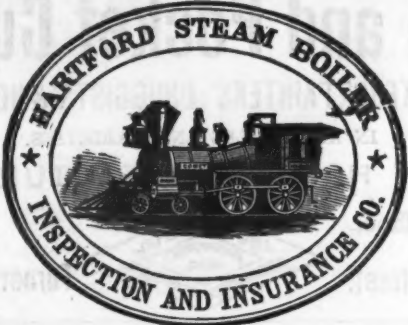
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3 1/4	45.00	52.00	4.95	14.00
3 1/2	54.00	62.00	5.50	17.00
4	64.00	73.00	6.00	21.00
4 1/4	74.00	84.00	6.50	25.00
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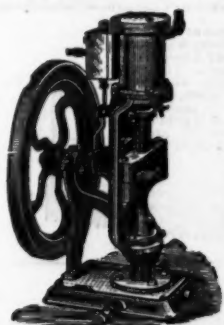
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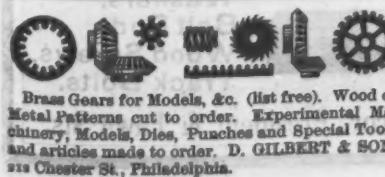
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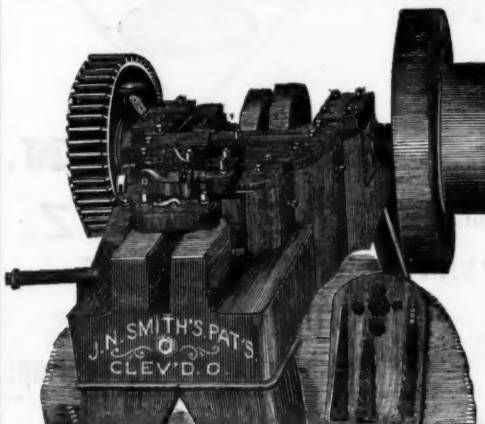
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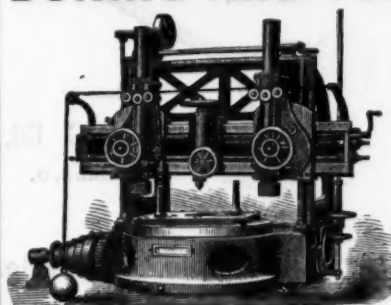
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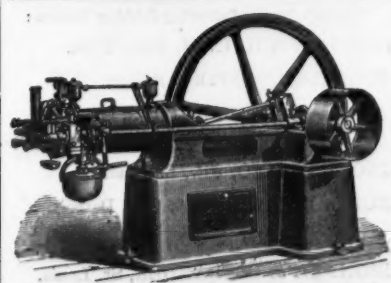
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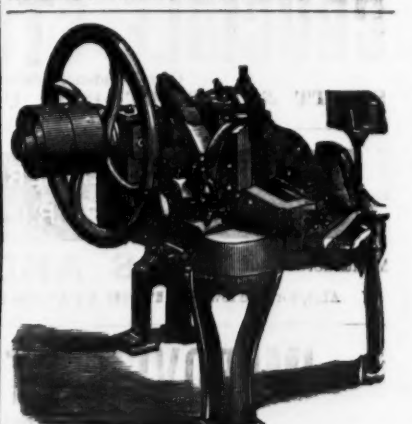
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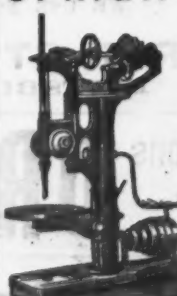
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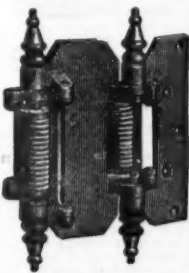
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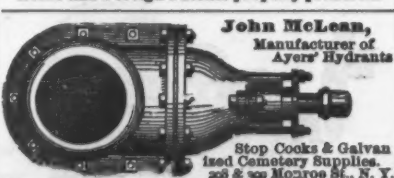
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TRIAL OF THE IMPROVED LIGHTNING SAW.

The Emperor Dom Pedro, accompanied by Director General Goshorn, Superintendent Albert, and others, visited Machinery Hall at the Centennial on the evening of June 28th. Among other things inspected, at the invitation of E. M. Boynton, of New York, they witnessed a trial of the New Lightning Saw, patented March 26, 1876. Two men, with one of these saws, cut off a sound log of gum-wood, one foot extreme diameter, in seven seconds, or at the rate of a cord of wood in five minutes. Messrs. Corlies, Morell, Lynch, and other members of the commission witnessed the trial and timed the cutting. The Emperor remarked, "That was fast, very fast cutting." Last evening the Emperor made another examination of the saw.—Philadelphia Press, June 30.

"Boynton's Saws were effectually tested before the judges at the Philadelphia Fair, July 6th and 7th. An ash log, 11 inches in diameter, was sawed off, with a 4 1/2 foot lightning cross cut, by two men, in precisely 6 seconds, as timed by the chairman of the Centennial Judges of Class Fifteen. The speed is unprecedented, and would cut a cord of wood in a minute. The representatives of Russia, Austria, France, Italy, Spain, Belgium, Sweden, England, and several other countries, were present, and expressed their high appreciation." Received Medal and Highest Award of Centennial World's Fair, 1876. \$1000 challenge was prominently displayed for six months, and the numerous saw manufacturers of the world dared not accept it, or test in a competition so hopeless.

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